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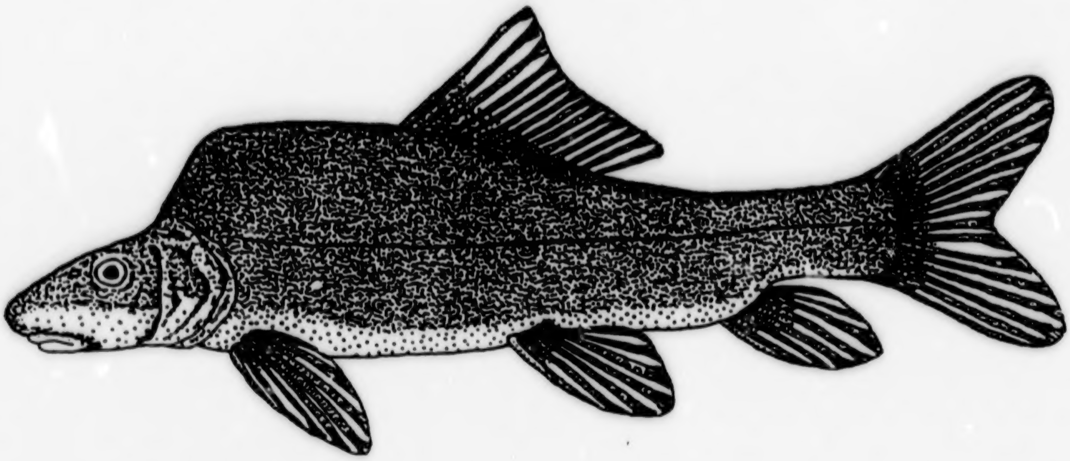
RECONNAISSANCE INVENTORY AND PRIORITIZATION OF EXISTING AND POTENTIAL BOTTOMLANDS IN THE UPPER COLORADO RIVER BASIN
1993-1994



Final Report
July 1995

U. S. FISH AND WILDLIFE SERVICE

95-042570

RECONNAISSANCE INVENTORY AND PRIORITIZATION OF EXISTING AND POTENTIAL BOTTOMLANDS IN THE UPPER COLORADO RIVER BASIN

1993-1994

Final Report

July 1995

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U. S. FISH AND WILDLIFE SERVICE

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This project was funded by the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. This Program is a joint effort of the U. S. Fish and Wildlife Service, U. S. Bureau of Reclamation, Western Area Power Administration, States of Colorado, Utah, and Wyoming, Upper Basin water users, and environmental organizations.

Recovery Implementation Program for the Endangered Fishes of the Upper Colorado River Basin, U. S. Fish and Wildlife Service, P. O. Box 25486, Denver Federal Center, Denver, Colorado 80225

RECOVERY PROGRAM FOR
THE ENDANGERED FISHES
OF THE UPPER COLORADO

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ACKNOWLEDGMENTS

We would like to thank the present and former Coordinator of the Floodplain Habitat Restoration Program from the U.S. Fish and Wildlife Service, Pat Nelson and Dr. Richard Wydoski, respectively, and John Hawkins, Larval Fish Laboratory, Colorado State University, Ft. Collins, for their guidance and assistance in developing appropriate research techniques and data evaluation. George Smith, Regional Hydrologist of the Fish and Wildlife Service, Denver, Colorado, and his staff provided hydrology support. Without support from key personnel in the Bureau of Reclamation, the hydrology portion of the study could not have been accomplished. Chuck Gallagher was instrumental in designing and establishing the field-based camera-recording equipment to obtain staff-discharge information. Terry Ayer, Blake Bailey, Burt Ives, Bob Levine, and Ted Juntilla from the Grand Junction, Colorado, Bureau of Reclamation Projects Office and Tom Jordan, Donavan Johnston and S. Lujan from the Provo, Utah, Office of the Bureau of Reclamation surveyed river cross sections. Pat Mangan and Andrew Montano from the Environmental Planning and Assessment Branch of the Bureau of Reclamation in Denver assisted with river cross sections. Bob Norman, Bureau of Reclamation in Grand Junction, and Tim Modde and Frank Pfeifer, Fish and Wildlife Service, provided administrative support. Both Bob and Jeff Baumgartner, The Nature Conservancy, often offered useful technical advice to the project. Gordon Mueller, Richard Wydoski, and Robert Muth provided useful comments and improved an earlier version of this report.

We are grateful for the field work, assistance, and advice provided by Steve Brock, Dan Schaad, and Kelli Stone from the Ouray National Wildlife Refuge, and Tom Hatch and Gary Baker from the Colorado River Fishery Project (CRFP) in Vernal, Utah. We would like to thank CRFP biological technicians, John Rosendale, Sara Persselin, Chris Flann, Quentin Bradwich, and Bruce Bonar for their assistance in collecting field data. Mike Baker, Mike Montagne, and Greg Taylor assembled staff gauges and fabricated ammo boxes for housing cameras for the hydrology portion of the study.

A special thanks goes to Greg Whitbeck and Mary Smuin from the U. S. Natural Resources Conservation Service, Vernal, Utah for the use of their camera equipment and photography skills. Carl Landini and his staff from the Consolidated Farm Service Agency in Grand Junction provided office space and digitizing equipment to obtain acreage estimates of bottomland habitat areas.

Dave Webster from the Farm Service Agency and Doyle Dow, real estate appraiser from the Bureau of Reclamation, were pivotal in working with local landowners in the Vernal, Utah, and Grand Junction and Delta, Colorado localities. We would also like to thank Randy Arment of Research Air, Inc. and Hank Heines of Dinaland Aviation for their skill and safety in assisting in the aerial reconnaissance survey work.

Aerial photographs of the Colorado and Gunnison rivers were provided by Grady McNure and Ken Jacobson of the U.S. Army Corps of Engineers Regulatory

Office, Grand Junction, Dr. Jack Stanford, University of Montana, and Paul Obert, U. S. Natural Resource Conservation Service, Delta. Ms. Judy Armstrong made historical photos available from the archive section at the Museum of Western Colorado.

Finally, we would like to thank each of the landowners for allowing us access to or through their land to each of the bottomland sites to conduct the on-ground hydrology screening--without their voluntary willingness to participate, much of the on-site hydrology and screening work could not have been accomplished. Those landowners include Mr. Oby Blanchard; Mr. Don Sheley, President of the Board, Clifton Sanitation No. 1; Mr. Frank Hyde and Mr. Brian Woods, Clifton Sanitation No. 2; Mr. L.O. Griffith; Mr. Kurt Mill, Colorado Division of Parks and Outdoor Recreation; Mr. Ed Gardner, Whitewater Building Materials; Mr. Harold Pike; EXXON Corporation, Houston, Texas; Mr. Bill Wilde, Battlement Mesa Partners; Mr. Wendell Johnson; Mr. Kenneth Johnson; Mr. Fred Wild; Mr. Ray Toole; and representatives from the City of Delta.

EXECUTIVE SUMMARY

The purpose of this study was to inventory all potential flooded bottomland habitats in the Upper Colorado River Basin that were believed to be important for recovery of endangered fishes, especially razorback sucker, and rank (prioritize) the bottomland sites. All potential bottomland habitats adjacent to stream reaches in the Upper Colorado River Basin (871 river miles) that were considered important for recovery of endangered fishes were inventoried in 1993. A total of 293 bottomland habitat sites in the Green River (135 sites) and Colorado River (158) drainages was identified, categorized, and classified using a five-step procedure to objectively prioritize bottomland sites. Each site was scored and prioritized (ranked) from four selection criteria (land ownership, proximity to a known or planned razorback sucker spawning area or proximity to recent adult captures, June hydrological connection to the river, and potential for a network [complex] of bottomland sites) that were based on available photographic imagery and the most current biological information. Prioritizing the bottomland sites was also used to establish staff gauge and river transect locations in 1994 to determine flows necessary to inundate a specific bottomland site.

In the Green River drainage, the largest flooded bottomland areas were located in the Browns Park National Wildlife Refuge reach (1,371 acres [555 ha]) and between Escalante Ranch and Pariette Draw (6,093 acres [2,466 ha]). The greatest concentration of flooded bottomland sites were within the Ouray National Wildlife Refuge (2,265 acres [917 ha]). In the Colorado River drainage, there were three distinct areas where bottomland habitats were concentrated. These were usually in large floodplain areas near agricultural centers. The first area was the stream reach between Rifle and Debeque, Colorado (2,248 acres [910 ha]), the second was the stream reach in the Grand Valley between Palisade and Loma, Colorado (4,564 acres [1,847 ha]), and the third area between the Cisco Boat Landing and McGraw and Hotel Bottoms (1,214 acres [491 ha]) upstream from Moab, Utah. Moab Slough, near Moab, Utah, was the largest, single bottomland area along the Colorado River encompassing approximately 875 acres (354 ha). In the Gunnison River drainage, the largest and only major floodplain area was between Austin, Colorado, and Roubideau Creek (1,739 acres [704 ha]; 17 river miles [27 rkm]).

The average inundated area during both the May and June runoff and the low-flow period in September was larger in the Green River (May and June: mean = 59 acres [24 ha]; September: mean = 19 acres [8 ha]) than any of the sites inundated in both the Colorado River (May and June: mean = 22 acres [9 ha]; September: mean = 10 acres [4 ha]) or Gunnison River (May and June: mean = 17 acres [7 ha]; September: mean = 3 acres [1 ha]).

In the Green River, the bottomland habitat sites between Pariette Draw and Escalante Ranch (32 sites) were ranked 1 through 11. Bottomland habitat in the Ouray National Wildlife Refuge (six sites) were the highest ranked (1st and 2nd) sites. The Browns Park National Wildlife Refuge (eight sites) sites ranked (12th-14th) the next highest, followed by lower ranked (17th-18th) sites from Pariette Draw to the Green and Colorado river confluence (92 sites). Based on these rankings, there were five general bottomland habitat

areas in the Green River. The top ranked sites were in the Ouray National Wildlife Refuge, the next in the Jensen to Brennan Bottom area, followed by sites downstream of Ouray. The lowest ranked sites were in the Browns Park National Wildlife Refuge area and from Desert Spring and Moon Bottom to the Green and Colorado river confluence. A vast majority (75%) of the bottomland habitat types in the Green River sub-basin were floodplain terraces. Federal agencies own most (75%) of the bottomlands in the vicinity of Browns Park National Wildlife Refuge. Forty-two percent of the land between Escalante Ranch and Brennan Bottom was in private ownership. All of the Ouray National Wildlife Refuge bottomland sites are federally owned. Seventy-one percent of the bottomland sites were on tribal lands between Ouray and Pariette Draw. The majority of bottomland habitat between Desert Spring and the Green and Colorado river confluence is federal land.

Unlike the Green River drainage, the top 13 ranked sites in the Colorado and Gunnison river drainages were scattered among four general areas. Along the Colorado River, there were 10 bottomland habitat sites within the Debeque area, eight sites within the 15-mile reach, and five sites within the 18-mile reach. There were three sites within the vicinity of Delta, Colorado, along the Gunnison River.

The top ranked site was the Walter Walker State Wildlife Area in the 18-mile reach. Four other sites in the immediate vicinity ranked 6th and 10th. Johnson Boy's Slough along the Gunnison River ranked 2nd, the Clifton Pond area along the Colorado River ranked 3rd, and the Debeque I-70 Slough ranked 4th. Six other sites immediately downstream of the Debeque I-70 Slough ranked 9th and 11th. Floodplain terraces comprised 37% of the bottomland habitat types, gravel-pit ponds 21%, and side channels 20%. Of the 110 bottomland sites identified and inventoried along the 241 miles of the Colorado River, 51% or about 6,355 acres (2,572 ha) were in private ownership. Of the 48 bottomland sites along 75 miles of the Gunnison River, 70% or about 2,221 acres (899 ha) were in private ownership. Fifteen percent (1,826 acres [739 ha]) of the ownership was in public (state and federal) ownership along the Colorado River; 22% (697 acres [282 ha]) was in public (state and federal) ownership along the Gunnison River. The greatest amount of bottomland habitat along the Colorado River owned by the federal government (83%) was within Canyonlands National Park. The federal government does not own any bottomlands between Rifle and Loma. The federal government owned or controlled only 8 percent of the bottomland habitat along the Gunnison River within a canyon-bound area between Roubideau Creek (rm 50 [rkm 81]) and the Colorado River confluence.

Hydrological parameters such as the annual frequency, magnitude, and duration of flooding at a site provide pivotal information that can be used to determine if a site is suitable for enhancement or restoration. This information could be used as an additional selection criterion to screen sites.

In 1994, channel cross sections were established where temporary staff gauges had been previously placed at seven bottomland sites adjacent to the Green River and at nine sites adjacent to the Colorado and Gunnison rivers to collect flow and elevation data from May through July. Stage vs. discharge relationships for each site were determined to estimate a range of flows necessary to inundate the bottomland site. However, the flows that were estimated to flood each of these bottomland sites should be considered provisional in this report until empirical verification can be obtained for these sites. Flow information was also used to determine the frequency that predicted flows might now occur at each bottomland site.

In the Green River drainage, of the seven sites evaluated, the Woods Bottom (Old Charlie Wash) bottomland site within the Ouray National Wildlife Refuge floods the most frequently, between 95-100% (i. e., between 9-1/2 and 10 years out of 10). Sheppard and Johnson Bottoms flood approximately 65-75% and 40-45% annually, respectively. The Baeser Bend site floods less frequently, only about 10-20% (one to two years out of 10). In the Colorado River drainage, of the nine sites evaluated, the Griffith bottomland site in the 15-mile reach of the Colorado River floods the most frequently, about 50% (one year out of two). The frequency of flooding at the Confluence Park bottomland site (an oxbow) on the Gunnison River now occurs only about 10-15% (one to one and one-half years out of 10) since the construction of upstream dams; a tertiary side channel at the Adobe Creek site is inundated about 20-25% (two to two and one-half years out of 10). Many of the other sites are now inundated less frequently because of the loss of the (historical) high-volume years, which are important to inundating off-channel habitats in the floodplain. Not only has the magnitude of runoff flows in May and June been reduced by about 45% in both the Colorado and Gunnison rivers, and by 22% in the Green River but the duration of flooding has also been reduced. Much of this is a result of upstream water development projects, primarily transmountain diversions and reservoir storage. The construction of levees and dikes, particularly along the Colorado and Gunnison rivers, has further reduced the likelihood of flooding by further isolating the floodplain from the main stream reaches and preventing water access during runoff. Given the present hydrologic regime, current water availability, and future compact water development in the Upper Colorado River Basin, inundating bottomland sites might be best accomplished by removing portions of- or entire human-made dikes or natural obstructions (e.g., levees) to increase flooding frequency. Those sites that flood more frequently under the existing hydrologic regime will also flood more frequently in the future, and will provide more benefits to endangered fish.

The priority recommendation was to collect additional flow and elevation data during runoff in 1995 at seven bottomland sites established in 1994 on the Green River and at four bottomland sites (Pike's and Adobe Creek on the Colorado River and Confluence Park and Johnson Boy's Slough on the Gunnison River) established in 1994 to verify and refine stage vs. discharge relationships. These data are particularly important for estimating flows necessary to inundate bottomland sites and vital in determining which sites can be practically restored. Other recommendations include, 1) completing contaminant screening for the remaining 19 bottomland sites investigated in 1994, 2) determining if three bottomland depression sites along the Colorado River between Moab, Utah, and the Green River confluence have suitable habitat for restoration, 3) obtaining a complete set of current color aerial photographs of the entire Upper Colorado River Basin, and 4) developing alternative or additional selection criteria, if warranted by site visits, to re-prioritize bottomland sites identified in this inventory.

INTRODUCTION

Background

Historically, Upper Colorado River Basin floodplains were inundated more frequently by flows during spring runoff, but today floodplains are not regularly connected to the river because of channelization by either levees and dikes or rip-rap near population centers in agricultural areas. Introduced salt cedar or tamarisk (*Tamarisk spp.*) has become established along the shoreline of major rivers resulting in sediment deposition and stabilized banks that further reduce the connectivity of the river with historic flooded bottomlands (Graf 1978). The periodicity of out-of-channel flooding in the Upper Colorado River has dramatically decreased following the onset of transmountain water diversions, irrigation diversions, and the construction of mainstem dams (Osmundson and Kaeding 1991). The construction of dikes coupled with the reduction of high spring flows has altered the natural hydrograph and either reduced or eliminated regular flooding of bottomlands. It is believed that flooded bottomlands may have served as nursery areas for the razorback sucker *Xyrauchen texanus* (McAda 1977; Osmundson and Kaeding 1991). In addition, Osmundson and Kaeding (1991) suggested that oxbow lakes and flooded pastures in the Grand Valley near Grand Junction, Colorado, were historically the primary spawning habitats of the razorback sucker. They also suggested that low-velocity, off-channel habitats were used by adult Colorado squawfish (*Ptychocheilus lucius*) during high stream flows.

Numerous studies (Grabowski and Hiebert 1989; Tyus and Karp 1989; Wydoski and Wick 1994) have suggested the importance of seasonal flooding to river productivity. Flooded bottomland habitats were considered important to adult razorback sucker for feeding prior to and after spawning and also important as nursery areas (Tyus and Karp 1989). Adult fish may have used these off-channel habitats for "velocity shelters" to escape high water velocities during spring runoff.

Turbid rivers in the upper basin are not very productive for zooplankton that are essential food for early life stages of razorback sucker. When compared to the riverine environment and river backwaters, inundated bottomland habitats produce the higher densities of zooplankton (Grabowski and Hiebert 1989; Mabey and Shiozawa 1993). Although predation by non-native fishes has been documented to be a limiting factor in survival of larval razorback sucker in the lower basin (Minckley et al. 1991), starvation may also limit survival (Marsh and Langhorst 1988; Papoulias and Minckley 1990). It is hypothesized that the loss of these productive flooded bottomland habitats is limiting recruitment of razorback sucker in the Upper Colorado River Basin because of insufficient quantity of appropriate-sized food organisms at the right time (Wydoski and Wick 1994).

Most flooded bottomland habitats occur in broad valleys along low-gradient stream reaches. Bottomlands are off- or out-of-channel habitats that include oxbow lakes, former side channels in broad valley floodplains, ponds, and wetland depressions and terraces. Less numerous flooded bottomland habitats are found in canyon-bound stream reaches. These are wetland depressions that are currently not connected to the river and receive water from groundwater infiltration, wetland terraces that are only inundated during flooded periods, or canyon mouths that are "ribbon-like" channels in narrow canyons adjacent to the main river flow. During high flow events, some of these off-channel features are temporarily connected to the river. Re-establishing connectivity to the mainstem river may provide off-channel habitats for endangered fishes that are essential for effective management of the riverine ecosystem and recovery of endangered fishes. Former natural riverine features could be integrated into the historic floodplain by removing portions of human-made dikes or natural obstructions (e.g., gravel and sand bars).

Habitat development and enhancement is identified as one of the five principal elements of the Recovery Program (U. S. Fish and Wildlife Service [FWS] 1987). Protection, restoration, and enhancement of inundated bottomland habitat along mainstem riparian corridors are believed to be important for recovery of razorback sucker. Riparian enhancement in the Upper Colorado River Basin can be accomplished by providing sufficient flows to inundate bottomlands in a manner that approximates the natural hydrograph. If sufficient flows cannot be obtained regularly, dikes and levees should be breached at intervals to allow inundation of lowlands during high spring flows. Restoration of flooded bottomland habitats will provide food that should increase survival of larvae and juveniles of endangered fishes as well as provide resting and feeding areas for adults. Before razorback sucker are reintroduced into historical stream reaches of the Upper Colorado and Gunnison rivers, a habitat enhancement program (i. e., flooded bottomland management) must be implemented if recovery is to be realized.

Purpose and Objectives

The purpose of this study was to summarize all potential flooded bottomland habitats in the Upper Colorado River Basin that were believed to be important for recovery of endangered fishes, especially razorback sucker. The inventory of these habitats provides managers with candidate sites for acquisition, restoration, and management. The objectives of the study were to:

1. Identify bottomlands adjacent to Upper Colorado River Basin mainstem rivers representing potential endangered fish habitat.

2. Categorize and classify the bottomlands identified according to potential value for endangered fish recovery.

3. Rank (prioritize) mainstem bottomlands by their perceived value to endangered fish recovery.

The end product is an inventory of mainstem flooded bottomlands categorized by size (area, extent of flooding, fish and water access, upland vegetation types, ownership, and related criteria. Sites were ranked as to potential contribution to endangered fish recovery.

Another objective was to conduct preliminary hydrology screening at a few (up to 20 sites) bottomland sites that ranked highest from the prioritization. We believed that predicting flows necessary for overbank flooding to inundate a bottomland site was necessary for determining sites that could be practically restored or enhanced.

STUDY AREA

The study area included the mainstem river channels and adjacent bottomland habitats in the Upper Colorado River Basin (Figure 1). River miles [(rm); river kilometers (rkm)] inventoried were 398 rm (640.5 rkm) in the Green River, 50 rm (80.5 rkm) in the Yampa River, 104.5 rm (168.2 rkm) in the White River, 241 rm (387.9 rkm) in the Colorado River, and 75 rm (120.7 rkm) in the Gunnison River.

METHODS

Inventory

A two-step approach was used to accomplish the bottomland inventory. First, potential bottomland habitats adjacent to mainstem rivers were identified and inventoried in 1993. Inventorying sites included cataloging various information from different photographic imagery. Second, each bottomland habitat site was classified using a numerical score from four selection criteria, and prioritized in 1994.

Identification of Bottomlands

All existing information necessary to conduct this aspect of the study was identified and assembled. This included topographical maps (7-1/2 minute quadrangle maps), land status maps, and various aerial photographic imagery that included videography, color infrared photographs, and 35-mm colored slides. Information sources included the U. S. Army Corps of Engineers, U. S. Bureau of Reclamation (BR), U. S. Bureau of Land Management, U. S. Natural Resources Conservation Service (NRCS), Argonne National Laboratories, and FWS.

A Cessna 206 fixed-winged aircraft was used to conduct low-level reconnaissance photography flights over bottomland habitats along the Green and Colorado rivers in 1993. The NRCS provided equipment and assistance during each photography session. A 35-mm camera loaded with color slide film was attached to the underside of the plane to facilitate direct overhead photography of bottomland sites. The plane was flown at an altitude of 5,000 to 6,000 feet (above ground level) directly overhead to allow for photo-image coverage of the main river channel and adjacent floodplain areas.

Aerial photographs were taken along the Green, Yampa, and White rivers in the Green River drainage and the Colorado and Gunnison rivers in the Colorado River drainage during 1993. The beginning and ending locations for flights in these river drainages were as follows:

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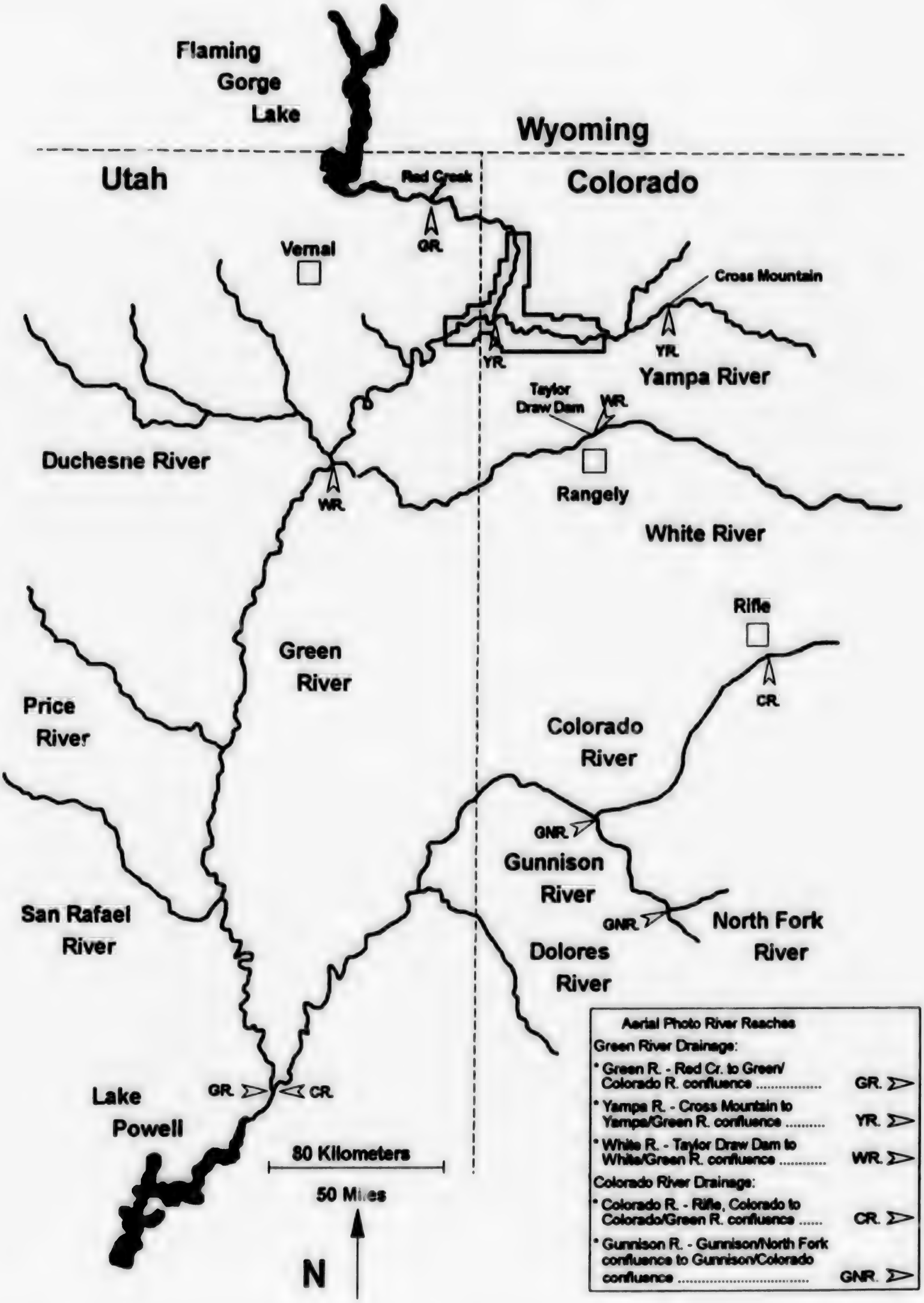
Flaming Gorge Lake
Wyoming
Utah
Colorado
Red Creek
GR.
Vernal
Cross Mountain
YR.
YR.
Yampa River
Taylor Draw Dam
WR.
Duchesne River
WR.
Rangely
White River
Rifle
Green River
CR.
Price River
Colorado River
GNR.
Gunnison River
San Rafael River
GNR.
North Fork River
Dolores River
Lake Powell
GR.
CR.
80 Kilometers
50 Miles
N
Aerial Photo River Reaches
Green River Drainage:
* Green R. - Red Cr. to Green/Colorado R. confluence .... GR.
* Yampa R. - Cross Mountain to Yampa/Green R. confluence .... YR.
* White R. - Taylor Draw Dam to White/Green R. confluence .... WR.
Colorado River Drainage:
* Colorado R. - Rifle, Colorado to Colorado/Green R. confluence ...... CR.
* Gunnison R. - Gunnison/North Fork confluence to Gunnison/Colorado confluence .... GNR.

Figure 1. Bottomland habitat inventory of the Upper Colorado River Basin, Colorado and Utah, 1993.

1. Green River drainage
    a. Green River from Browns Park to the Green and Colorado river confluence (rm 0-398 [rkm 0-640.5]).
    b. Yampa River from Cross Mountain to the Yampa and Green river confluence (rm 0-50 [rkm 0-80.5]).
    c. White River from Taylor Draw Dam to the White and Green river confluence (rm 0-104.5 [rkm 0-168.2]).
2. Colorado River drainage
    a. Colorado River from Rifle, Colorado to the Colorado and Green river confluence (rm 0-241 [rkm 0-387.9]).
    b. Gunnison River from the Gunnison and North Fork river confluence to the Gunnison and Colorado river confluence (rm 0-75, [rkm 0-120.7]).

Aerial photographs were taken during high, medium, and low flows in the Green River drainage and during high and low flows in the Colorado River drainage. Flows were determined using the U.S. Geological Survey (USGS) stream gauge on the Green River at Jensen, Utah, the Stateline stream gauge on the Colorado River near the Utah and Colorado stateline, and the Gunnison River stream gauge at Whitewater, Colorado. The target water discharge (cubic feet per second [cfs]) and date for aerial photographs were as follows:

1. Green River drainage
    a. High flows between 18,000 and 20,000 cfs on 25 May 1993 in the Green, Yampa, and White rivers.
    b. Medium flows between 6,000 and 12,000 cfs on 15 and 30 June 1993 in the Green River between Split Mountain and Sand Wash.
    c. Low flows between 1,000 and 2,000 cfs on 28 September 1993 in the Green, Yampa, and White rivers.
2. Colorado River drainage
    a. High flows between 18,000 and 20,000 cfs in the Colorado River and 7,000 and 9,000 cfs in the Gunnison River on 10 June 1993.
    b. Low flows between 4,000 and 5,000 cfs in the Colorado River and 2,000 and 3,000 cfs in the Gunnison River on 28 September 1993.

After consultation with personnel from the NRCS, it was determined that one photograph per river mile was necessary to adequately photo-document bottomland habitat areas. It was estimated that it would take approximately

habitats important to endangered fishes in the Green River, Colorado and Utah, 1993 (Part 2). E-2,E-4,E-6,E-8

E. Table E.3. The 10 parameters from 35-mm color slide photo-imagery used to categorize and rank bottomland habitats important to endangered fishes in the Yampa River, Colorado, 1993 (Part 1) E-9

23-28 rolls[1] of color slide film to photograph the 871 miles of river bottomland areas delineated in the Green, Yampa, White, Colorado, and Gunnison rivers.

A list identifying the location of each bottomland habitat site was formulated from the aerial 35-mm color slides and color infrared photographs. All slides shot per photo session were meticulously cataloged according to film roll number and slide sequence number, date, river, river mile, and river location, and then stored in slide holders and binders for future reference.

Once the color slides were organized by river and river mile, they were viewed to identify and locate specific bottomland areas of potential endangered fish habitat. The bottomland areas on these slides were then computer digitized or overlaid with a transparent area grid to estimate flooded acreage. Estimates of area were within ±10%.

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[1]

$$Rolls=\left[\left(\frac{1Photo}{Riv.Mi.}\right)\times\left(\frac{871Riv.Mi.}{Drainage}\right)\times\left(\frac{1Roll}{36Photos}\right)\right]\approx 24Rolls(36Exposure)$$

Classification of Bottomlands

Ten categories of information were used in cataloging, categorizing, and prioritizing bottomland habitats in the Upper Colorado River Basin. These parameters included (see Appendix E):

1. Basin, sub-basin, river
2. Bottomland Location: site, river mile, township, range, section
3. Runoff (May and June)
    a. Total potential (historical) inundated area in acres and hectares; the total area that could be potentially flooded during historic or the pre-water development era
    Note: the 100-year floodplain was used to estimate the historical inundated area
    b. Inundated (yes/no)
    c. Total inundated area (acres/hectares); the actual or realistic area flooded
    d. Hydrological connection to mainstem river
        1) yes/no
        2) number of connections
        3) connections up- or downstream
        4) other water sources (groundwater, gravity feed, tributary/stream)
4. Post-runoff (September)
    a. Total potential (historical) inundated area in acres and hectares
    Note: the 100-year floodplain was used to estimate the

considered for selection criteria for scoring and ranking bottomland sites in the Upper Colorado River Basin H-1

I. Figure I.1. Percent of time flow (cfs) is exceeded in the Green River before (1947-1966) and after (1966-1993) Flaming Gorge Dam I-1

        historical inundated area
    b. Inundated (yes/no)
    c. Total inundated area (acres/hectares)
    d. Hydrological connection to mainstem river
        1) yes/no
        2) number of connections
        3) connections up- or downstream
        4) other water sources (groundwater, gravity feed, tributary/stream)

5. Levy/Berm
    a. Levy/berm dividing mainstem and bottomland
        1) yes/no
        2) human-made or natural
    b. Levy width of length (meters)
6. Vegetation (upland)
    a. Yes/no
    b. Predominant type(s)
7. Proximity to Endangered Fishes
    a. River mile
    b. Species
    c. Life stage
8. Predominant Floodplain Habitat Type (terrace, depression, gravel-pit pond, canyon mouth)
9. Land Ownership (Federal, State, Private, Tribal)
10. Photo Imagery
    a. Type (ASCS-35-mm, U.S. Army Corps of Engineers, University of Montana, Color Infrared)
    b. Catalog No.

Scoring and Prioritization of Sites

Several classification systems were evaluated for suitability in classifying and ranking bottomland habitats that were perceived to be potentially valuable for providing endangered fish habitat (Cowardin et al. 1979; Brinson 1992; The Nature Conservancy 1992; Lyon 1993). Constraints of time and personnel precluded using these detailed classification systems for the bottomland inventory. Instead, a five-step procedure was developed in 1994 by a three-member team[2] to score and rank bottomland sites. Prioritizing sites assisted in identifying locations where staff gauges and river transects would be established in 1994 to predict flows necessary to inundate a bottomland site. The five steps were:

Step 1: Initially, criteria were developed to assist in discriminating and prioritizing bottomland sites using available photographic imagery and the most current biological information. The initial list included area, ownership, proximity to razorback sucker use (historical and current), water

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[2] USFWS: Pat Nelson, Coordinator of the Floodplain Habitat Restoration Program, Region 6, Denver, Colorado; Bob Burdick, Fishery Biologist, Colorado River Fishery Project (FWS), Grand Junction, Colorado; and David Irving, Fishery Biologist, Colorado River Fishery Project, (FWS), Vernal, Utah. The meeting was facilitated by Chuck Gallagher (BR), Grand Junction, Colorado.

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duration (June-September), hydrological connection to river during runoff (May and June), wetland feature (yes/no), suitability for fish or water control structures, presently diked or rip-rapped (yes/no), and potential for a network of sites (within 25 river miles of known historical or current razorback sucker use)(Appendix H; Table H.1.).

Step 2: Because many of the bottomland sites had not been visited prior to the prioritization process, five of the initial criteria considered were discarded. The five criteria eliminated were, 1) area, 2) wetland feature, 3) suitability for fish or water control structures, 4) presently diked or rip-rapped, and 5) water duration. Other criteria necessary to prioritize sites such as screening for contaminants, densities of non-native fishes and their species composition, and geomorphology would require site visits. Because there was not enough time to visit all sites prior to the high water of 1994, criteria were chosen that could be used with available photographic imagery to determine bottomland sites where preliminary hydrology screening would be conducted in the spring of 1994. From the initial nine criteria, four selection criteria with common characteristics among bottomland sites were chosen. These four criteria were used to evaluate, score, and rank bottomland sites for planning the 1994 hydrology studies. These four selection criteria are considered preliminary and could be revised, substituted, or supplemented if warranted by site visits. If alternative or additional criteria are developed, all bottomland sites listed in this inventory would have to be re-scored, re-ranked, and a new prioritization list generated. The four selection criteria used were:

A. Status of land ownership
B_1. Green River: proximity to a known or planned razorback sucker spawning area
B_2. Colorado River: proximity to recent adult razorback sucker captures (1974-1993)
C. Having a June hydrological connection to the river
D. Potential for a network (complex) of bottomland sites

Step 3: The selection criteria were compared against each other to obtain a weighting factor. A paired analysis allowed a comparison of one criterion against the other three criteria. A point value was subjectively assigned to each selection criteria as follows:

4 = major importance
3 = medium importance
2 = minor importance
1 = no preference

Each team member, assigned a point value for each selection criterion. The point values of team member were totaled and averaged. The average was rounded to the nearest whole number to give a total average point value. Next, the selection criteria were classified with the highest total average point value being the most important selection criteria and the lowest total average point value being the least important criteria (Table 1).

digitizing equipment to obtain acreage estimates of bottomland habitat areas.

Dave Webster from the Farm Service Agency and Doyle Dow, real estate appraiser from the Bureau of Reclamation, were pivotal in working with local landowners in the Vernal, Utah, and Grand Junction and Delta, Colorado localities. We would also like to thank Randy Arment of Research Air, Inc. and Hank Heines of Dinaland Aviation for their skill and safety in assisting in the aerial reconnaissance survey work.

Aerial photographs of the Colorado and Gunnison rivers were provided by Grady McNure and Ken Jacobson of the U.S. Army Corps of Engineers Regulatory

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Step 4: Sub-criteria for each of the four selection criteria were necessary in order to ensure that bottomland sites could be classified without tie-scores. Each selection criterion was then further divided into sub-criteria that were subjectively assigned a point value as follows:

Criterion A: Status of land ownership

3 = Federal ownership
2 = State ownership
1 = Private or Tribal ownership

Table 1. Paired comparison analysis of the four selection criteria[a]. When a criterion is compared to itself it receives a point value of 1 (e.g., A:A = 1). When two criteria are compared, the one that is selected as being more important receives the point value. For example, B:A means that criterion B was perceived to contribute more to endangered fish recovery than criterion A, and therefore received the point value. Because criterion B was chosen over criterion A, the A:B comparison received no point value.

	A[a]	B[a]	C[a]	D[a]
A	A:A 1	B:A (3+3+4)/3=3.3	C:A (4+4+4)/3=4.0[b]	D:B 0
B	A:B 0	B:B 1	C:B 0	D:B 0
C	A:C 0	B:C (4+4+4)/3=4.0	C:C 1	D:C (3+3+3)/3=3.0
D	A:D 0	B:D (3+3+4)/3=3.3	C:D 0	D:D 1
Total Average Point Value[c]	(1+0+0+0)=1	(3.3+1+4.0+3.3)=12	(4.0+0+1+0)=5	(3.3+0+3.0+1)=7

[a] Criterion A = Land ownership status, Criterion B = Proximity to a known or planned razorback sucker spawning area (Green River) or proximity to recent adult razorback sucker captures (Colorado River), Criterion C = June hydrological connection to river, Criterion D = Potential for a network (complex) of bottomland sites.

[b] The equation (3+3+4)/3 = 3.3 represents two events. The (3+3+4) portion of the equation is the three point values assigned the criterion by each team member. The product of the equation or 3.3 is the average weighted point value of the selected criterion.

[c] The total average point value is the sum of the average weighted point values for each selected criterion. (These values were rounded to the nearest whole number.)

Criterion B_1 (Green River): Proximity to a known or planned razorback sucker spawning area

5 = within 1-25 river miles downstream of a spawning area
4 = within 26-50 river miles downstream of a spawning area
3 = within 51-75 river miles downstream of a spawning area
2 = more than 75 river miles downstream of a spawning area
1 = upstream of a spawning area

Criterion B_2 (Colorado River): Proximity to recent adult razorback sucker captures (using data from 1974-1993, [Burdick 1992; Quarterone 1993])

5 = 100 captures
4 = 50-99 captures
3 = 15-49 captures
2 = 6-14 captures
1 = 0-5 captures

Criterion C: Having a June hydrological connection to the river

3 = yes
2 = unsure
1 = no

Criterion D: Potential for network (complex) of bottomland sites

5 = yes, ≥ 8 sites
4 = yes, 6-7 sites
3 = yes, 4-5 sites
2 = yes, 2-3 sites
1 = no, only 1 site

Step 5: The sub-criteria raw scores were then multiplied by the total average weighted point values to produce a total score for each bottomland site. The total score was sorted from the lowest to the highest with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank was the lowest priority site in the bottomland inventory. The Green River drainage was scored and prioritized independently from the Colorado and Gunnison river drainages.

Geomorphology

Three general geomorphological categories were used to simplify bottomland classification and identify habitat types. These categories were floodplain depression, floodplain terrace, or gravel-pit pond (Figure 2). These three categories were the most numerous encountered in the inventory, although there were other habitat types such as canyon mouths.

The average inundated area during both the May and June runoff and the low-flow period in September was larger in the Green River (May and June: mean = 59 acres [24 ha]; September: mean = 19 acres [8 ha]) than any of the sites inundated in both the Colorado River (May and June: mean = 22 acres [9 ha]; September: mean = 10 acres [4 ha]) or Gunnison River (May and June: mean = 17 acres [7 ha]; September: mean = 3 acres [1 ha]).

In the Green River, the bottomland habitat sites between Pariette Draw and Escalante Ranch (32 sites) were ranked 1 through 11. Bottomland habitat in the Ouray National Wildlife Refuge (six sites) were the highest ranked (1st and 2nd) sites. The Browns Park National Wildlife Refuge (eight sites) sites ranked (12th-14th) the next highest, followed by lower ranked (17th-18th) sites from Pariette Draw to the Green and Colorado river confluence (92 sites). Based on these rankings, there were five general bottomland habitat

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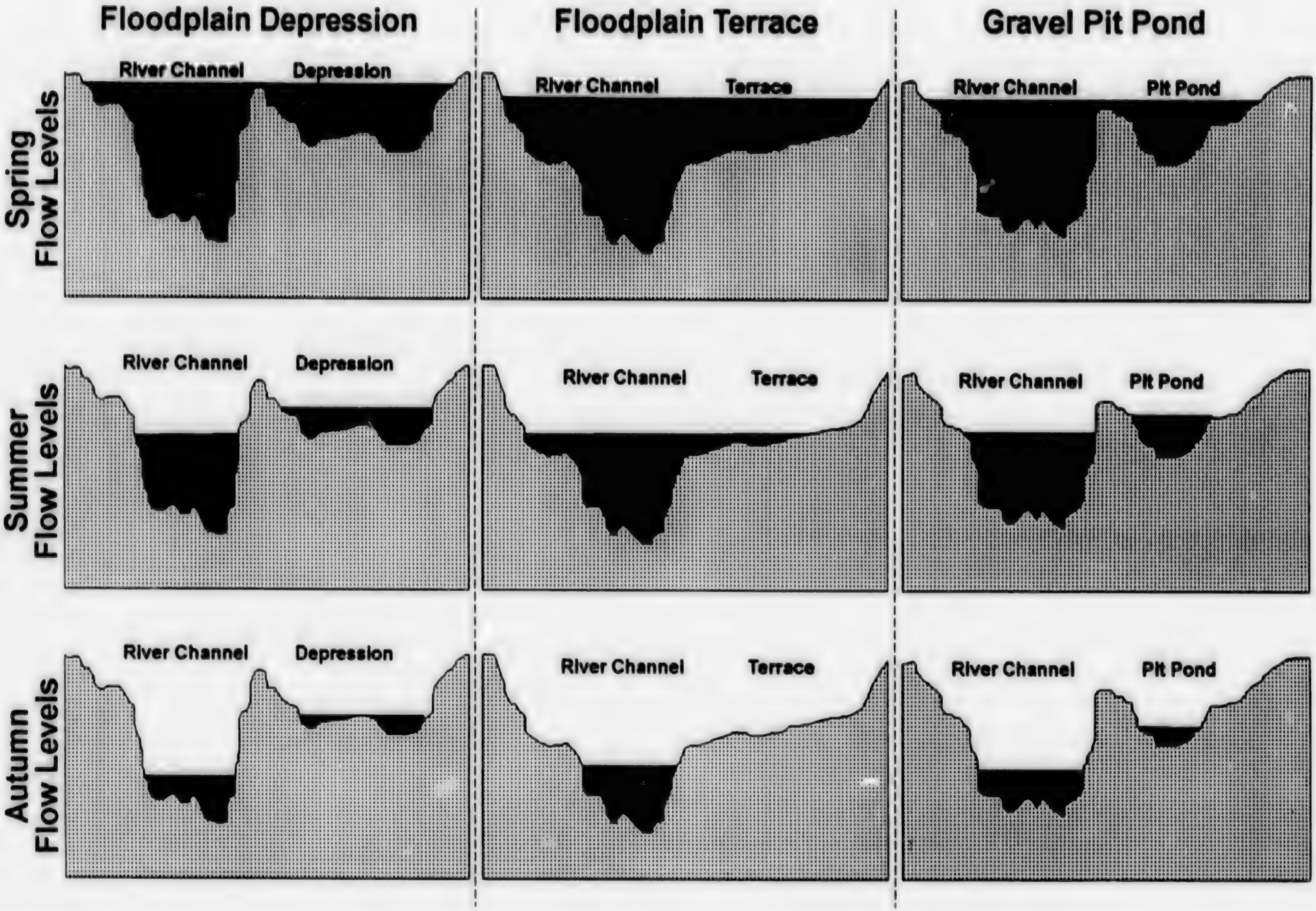

Figure 2. Schematic of the bed profile of the three major bottomland habitat classifications at various flow regimes in the Upper Colorado River Basin.

Ecology

Five candidate sites were selected prior to the bottomland inventory and were proposed as sites to conduct demonstration studies aimed at testing hypotheses regarding flooded bottomland restoration for endangered fishes. Wetland hydrology, water chemistry, and vegetation and invertebrate inventory studies were completed at these five bottomland sites in spring 1994. The studies were conducted at two sites along the Colorado River, in the Moab Slough bottomland site (Cooper and Severn 1994a), and at the 29-5/8 Road gravel-pit pond site (Cooper and Severn 1994b). The Escalante State Wildlife Area bottomland site (Cooper and Severn 1994c) on the Gunnison River and two sites along the Green River, the Escalante Ranch bottomland (Cooper and Severn 1994d) and one area within the Ouray National Wildlife Refuge (Old Charlie Wash [Woods Bottom] Cooper and Severn 1994e) were also studied. A conceptual plan was developed for each of these five sites that discussed experimental strategies, research, and evaluation that could be used to restore and enhance various types of bottomland habitats to assist recovery of endangered fishes. (Moab-Collins 1994; Escalante Ranch-Richardson 1994; Old Charlie-Modde and Irving 1994; Escalante State Wildlife Area-Burdick 1994a and 29-5/8 Road gravel pit pond-Burdick 1994b).

Hydrology

Stage vs. Discharge Relationship

Hydrological parameters such as the timing, magnitude, and duration of flooding at a site are pivotal information to determine if a site is suitable for enhancement or restoration. This information was used to screen sites by determining how often or frequent does a site flood and how long (duration) does the site remain wetted following flooding.

Temporary staff gauges were placed at seven bottomland sites adjacent to the Green River and at nine sites adjacent to the Colorado and Gunnison rivers to collect flow vs. elevation data from May through July 1994. These data would be used to establish stage vs. discharge relationships for each site and to estimate a range of flows necessary to inundate the bottomland site. Staff gauge placement corresponded nearest low areas along the river channel where water would enter into the adjacent bottomland areas. However, in some instances, the staff gauge was not placed at the lowest point because cameras would have been inundated at high water. Automatic, programmable 35-mm cameras were placed inside plexiglass-faced ammunition boxes and were aimed at each staff gauge to photo-document water level changes over time. Each camera was set to take pictures that ranged from 4 to 12 hours. Film was exchanged about every 10 to 14 days. The elevation of the top of the staff gauge was surveyed as a future reference point. Two ground reference control points were established at each site. In the Colorado and Gunnison rivers, the control point was arbitrarily set at a relative elevation of 1000.0 feet (305 m). In the Green River drainage, elevation control points were absolute (feet above sea level). Reinforcing rod with an aluminum survey cap served as the control point headpin.

The staff gauge water-level changes were recorded on computer spreadsheets. Daily streamflow data were obtained from USGS stream gauges nearest the bottomland site for dates and times when stage elevations were recorded. This information was used with BR flow models to determine a stage vs. discharge relationship for each site. From several hundred possible equations, this model provides the equation which best describes the stage vs. discharge relationship and the regression correlation coefficient. The information was used to estimate flows necessary to inundate each of the bottomland sites.

Channel Cross Sections

To determine if channel configuration (depth and width) at each of these bottomland sites would remain constant or change over time with various discharges, it was necessary to obtain streambed profile information. If there were a change, this might affect the amount of flow necessary to inundate the site or the amount of fill material that would have to be removed to allow water access to the bottomland site. Therefore, transects were established at each bottomland site where staff gauges had previously been located. Kevlar cable was stretched across the entire channel between two steel fence posts. Channel cross sections usually encompassed the entire 10-year floodplain. Transects were surveyed by BR personnel from high points from the right shoreline to the left shoreline that crossed secondary and tertiary channels, backwaters, and islands. All distance and elevation measurements were obtained with an electronic distance meter (EDM), that corrected for up- and downstream distances from the transect. Across the transect, elevations were recorded at every 10-foot interval or at every significant grade break. Bed width was plotted against either absolute (Green River) or relative (Colorado and Gunnison rivers) elevations.

River Discharge

Mean daily streamflows were correlated with the dates when staff-gauge data were obtained. Also, mean daily flows for pre- and post-water development periods were obtained to generate flow exceedences. The period of record at a stream gauging station that best represented present water availability which would inundate a bottomland site was used. The Jensen, Utah gauge was used for bottomland sites adjacent to the Green River. The pre-water development period, 1947-1966, and post-water development period, 1966-1993, were analyzed at the Jensen gauge. For the two sites on the Gunnison River, the Delta gauge (1977-1993) was used for the Confluence Park bottomland site and the Whitewater gauge (1967-1993) near Grand Junction for the Johnson Boy's Slough site. Stateline gauge (1952-1993) was used for the Adobe Creek site along the Colorado River. The Cameo gauge (1952-1993) was used for the two sites between Debeque and Rifle, Colorado. For the four bottomland sites in the 15-mile reach, a different approach was used to determine streamflows. Although there is a USGS stream gauge immediately downstream of the Grand Valley Diversion, there are only three years of flow data. Therefore, the mean daily flows at the Cameo and Plateau Creek (1970-1993) stream gauges were summed and the water diversions at Government

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Highline and Grand Valley Diversion were subtracted.

Land Ownership Status

A team[3] composed of fisheries and realty experts contacted landowners who owned bottomlands along the Green, Colorado, and Gunnison rivers in August and September 1994 to discuss options for acquisition, lease, or easement. Either on-site visits or telephone contacts were made with landowners of the sites that were initially selected for hydrology screening. For the Green River, these bottomland sites included the Meril Snow Ranch, Little Stewart Lake, Baeser Bend, Brennan Bottom, and Pariette Draw. For the Gunnison River, these bottomland sites included Johnson Boy's Slough and Confluence Park. For the Colorado River, Adobe Creek, Griffith's, Clifton Sanitation No. 1, Pike's, and Battlement Mesa. During each visit, team members explained the purpose of the Recovery Program for the Endangered Fishes of the Upper Colorado, distributed the pamphlet entitled, "Swimming Upstream: The endangered fish of the Colorado River", and provided a prepared statement of commonly asked questions with answers (see Appendix A).

Permission to access private property was requested to collect additional biological data, conduct on-site screening for contaminants, and to acquire river channel and bottomland profile survey data. A Right-of-Entry Permit form was developed for signature to all parties for legal purposes (see Appendix A).

RESULTS AND DISCUSSION

Photographic Data

Prior to 1993, there were few sources of up-to-date photographic coverage that temporally and spatially covered warmwater reaches of the Upper Colorado River Basin. Most available maps, photographs, and videos were either confined to the main river channel and did not include adjacent floodplain and bottomland areas or were too small in scale to be useful in determining areas that would be inundated. A complete set of high-altitude, infrared photographs would have been the preferred imagery for this survey because they were scaled and easiest to interpret, but were too expensive.

A plan for complete and partial inventories of the Upper Colorado River Basin is presented in Appendix C. The videography could not be used because it was taken only for specific stream reaches and did not provide consistent information useable for the entire bottomland survey.

Over 2,000 color 35-mm slides were taken during four low-level reconnaissance photography flights over bottomland habitats in the Upper Colorado River Basin. These photographs are documented and stored in binders at the Colorado River Fishery Project offices in Vernal, Utah (Green, Yampa, and White rivers), and in Grand Junction, Colorado (Colorado and Gunnison rivers).

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[3] The Green River team consisted of David Irving, FWS, Dave Webster, NRCS, and Doyle Dow, BR. The Colorado River team consisted of Bob Burdick, FWS, and Doyle Dow.

Water Discharge on Photograph Dates

Aerial photographs were taken in May 1993, 3 days before peak flow in the Green River and 2 days after peak flow in the Yampa and White rivers (Figure 3). Photographs were taken on the lowest flow day in September in the Green River and about 3 weeks after low flow in the Yampa and White rivers.

Aerial photographs were taken in June 1993, 13 days after peak flow in the Colorado River and 23 days after peak flow in the Gunnison River (Figure 3). Photographs were taken on the lowest flow day in September in the Gunnison River and about three weeks after low flow in the Colorado River.

Distribution of Bottomland Habitats

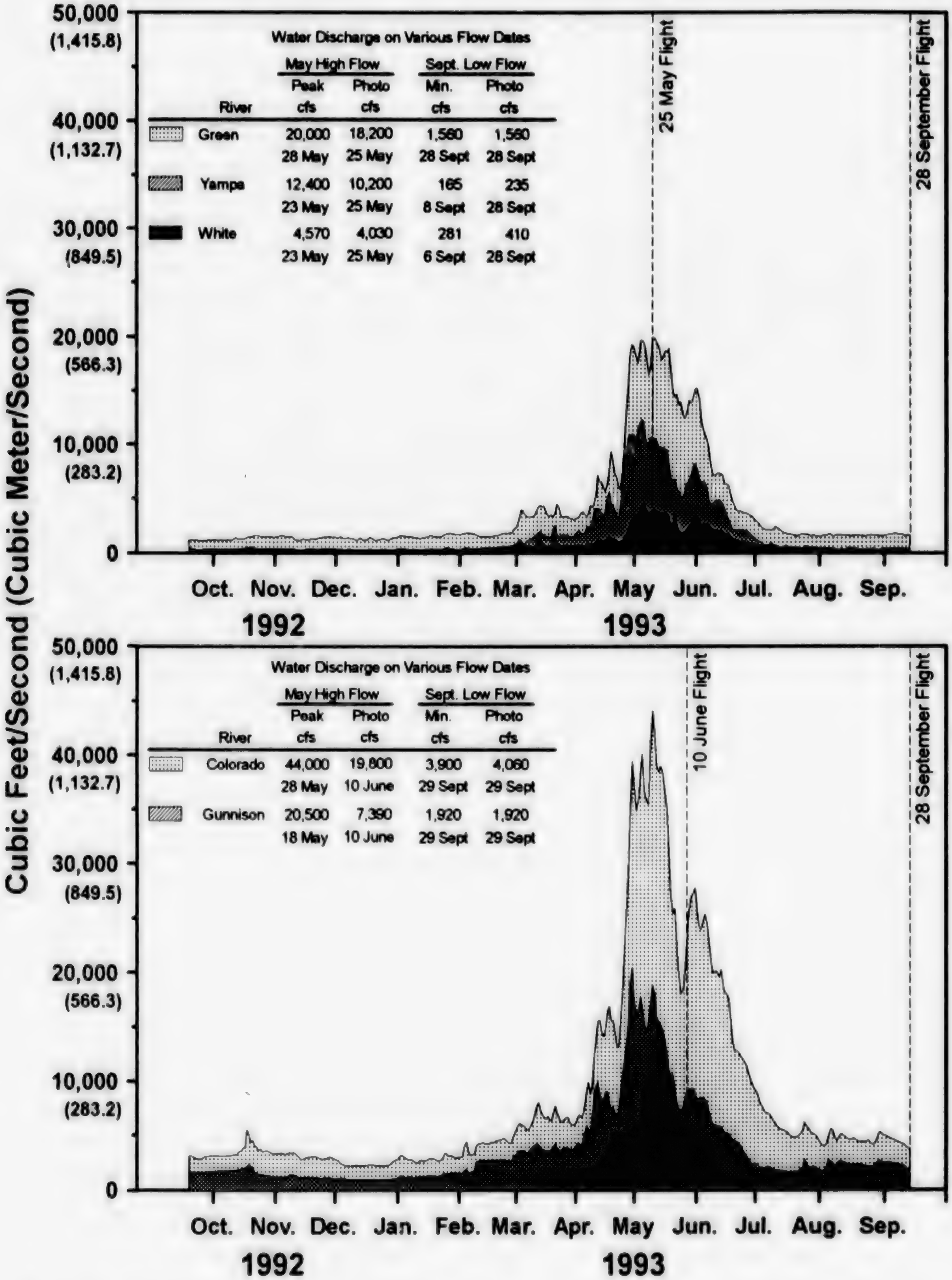
Green River. There were 132 bottomland habitat sites with a potential (historical) of 18,430 acres (7,459 ha) along the Green River (rm 0-393 [rkm 0-632]) in 1993 (Appendix D; Table D.1.). Of this total, 7,720 acres (3,124 ha; 74 sites) were inundated during the May high-water flow period and 2,438 acres (987 ha; 28 sites) in the September low-water flow period.

The largest flooded bottomland areas (Figure 4) were located in the Browns Park National Wildlife Refuge reach (rm 368-393 [rkm 592-633]; 1,371 acres [555 ha]) and between Pariette Draw and the Escalante Ranch (rm 238-310 [rkm 383-499]; 6,093 acres [2,466 ha]). The greatest concentration of flooded bottomland sites were within the Ouray National Wildlife Refuge (rm 249-265 [rkm 401-427]; 2,265 acres [917 ha]). Only 16% (12 sites) of the 74 sites flooded in May had a hydrological connection to the river, whereas 89% (24 sites) of the 28 sites that were wetted in September were still connected to the river (Appendix E; Tables E.1 and E.2). The majority of these sites had only one connection to the river. Sixteen percent (12 sites) of the May flooded sites received some water from gravity fed (irrigation) water sources and 84% (62 sites) received water from groundwater sources.

Of the 132 potential bottomland sites, 4% (6 sites) had natural levees between them and the river, whereas 11% (15 sites) had human-made levees or berms. Over 70% (93 sites) had emergent vegetation in May.

There were 30 floodplain depression bottomland habitat types and 99 floodplain terrace habitat types along the Green River. The remaining flooded habitat types consisted of two flooded gravel pits and one flooded river confluence.

Yampa River. Only 22 acres (9 ha; 1 site) of bottomland habitat were available in the Yampa River just upstream of the Yampa and Snake river confluence (rm 48 [rkm 77]) in 1993 (Appendix D; Table D.1.). It was flooded during the May high-water period, but dry in the September low-flow period



Water Discharge on Various Flow Dates

River	May High Flow Peak cfs	 Photo cfs	Sept. Low Flow Min. cfs	 Photo cfs
▒ Green	20,000 28 May	18,200 25 May	1,560 28 Sept	1,560 28 Sept
▨ Yampa	12,400 23 May	10,200 25 May	165 8 Sept	235 28 Sept
■ White	4,570 23 May	4,030 25 May	281 6 Sept	410 28 Sept

Water Discharge on Various Flow Dates

River	May High Flow Peak cfs	 Photo cfs	Sept. Low Flow Min. cfs	 Photo cfs
▒ Colorado	44,000 28 May	19,800 10 June	3,900 29 Sept	4,060 29 Sept
▨ Gunnison	20,500 18 May	7,390 10 June	1,920 29 Sept	1,920 29 Sept

Figure 3. Water discharge (cfs) at peak and low-flow periods on the Green, Yampa, White, Colorado, and Gunnison rivers, Colorado and Utah, 1992 and 1993.

(100-300 cfs). It was connected to the river by a side channel in May, received some of its water from groundwater sources, and had no emergent vegetation (Appendix E; Tables E.3. and E.4.).

White River. A potential (historical) of 634 acres (257 ha; 2 sites) of bottomland habitat was available adjacent to the White River (rm 0-93 [rkm 0-37.6]) in 1993 (Appendix D; Table D.1.). Of this total, 515 acres (208 ha; 2 sites) were flooded during the May high-water flow period, and 18 acres (7 ha; 1 site) were inundated during the September low-flow period.

The oxbow downstream of Highway 65 (rm 92 [rkm 148]) was inundated from May through September, whereas the confluence of the White and Green rivers (rm 0-3 [rkm 0-5]), with the greatest bottomland area, was dry in September. Both the oxbow and confluence sites were connected to the river in May and the oxbow site was connected to the river in September (Appendix E; Tables E.5. and E.6.). Both sites received some of their water from groundwater sources, but only the confluence site had emergent vegetation. The oxbow site was a flooded side-channel and the confluence site was a floodplain terrace.

Colorado River. There were 110 bottomland habitat sites with a potential (historical) of 12,315 acres (4,984 ha) along the Colorado River (rm 0-241 [rkm 0-388]) in 1993 (Appendix D; Table D.2.) Of this total, 2,472 acres (1,000 ha; 101 sites) were inundated during the May and June high-water flow period and 1,135 acres (459 ha) in the September low-water flow period.

There were three distinct areas where bottomland habitats were concentrated. These were usually in large floodplain areas near agricultural centers. The first area was the stream reach between Debeque and Rifle, Colorado (rm 203-240 [rkm 327-386]); 2,248 acres [910 ha]), the second was the stream reach in the Grand Valley between Loma and Palisade, Colorado (rm 152-185 [rkm 245-298]; 4,564 acres [1,847 ha]), and the third area between the McGraw and Hotel Bottoms and the Cisco Boat Landing (rm 99-110 [rkm 159-177]; 1,214 acres [491 ha]). Moab Slough (rm 62-64 [rkm 100-103], downstream of these three areas near Moab, Utah, is the largest single bottomland area along the Colorado River encompassing approximately 875 acres (354 ha)(Figure 5).

Bottomland areas in canyon-bound stream reaches of the Colorado River were typically small in acreage. These areas included Canyonlands National Park downstream of Moab, Utah (rm 61-0 [rkm 98-0]), Moab Canyon (rm 64-77 [rkm 103-124]), Hittle Bottom to McGraw Bottom (rm 88-99 [rkm 142-151]), Ruby and Horsethief canyons (rm 131-152 [rkm 211-245]), and Debeque Canyon (rm 188-204 [rkm 303-328]).

Seventy-one percent (71 sites) of the 100 sites flooded in May had a hydrological connection to the river, whereas 77% (43 sites) of the 56 sites still wet in September were connected to the river (Appendix E; Tables E.7. to E.13.) Although 71 sites were inundated during May and June, 26 sites had only one surface connection to the river and 15 sites had both an up- and downstream surface connection. Twenty-one percent of the May flooded sites received some water from gravity-fed (irrigation) water sources and 56%

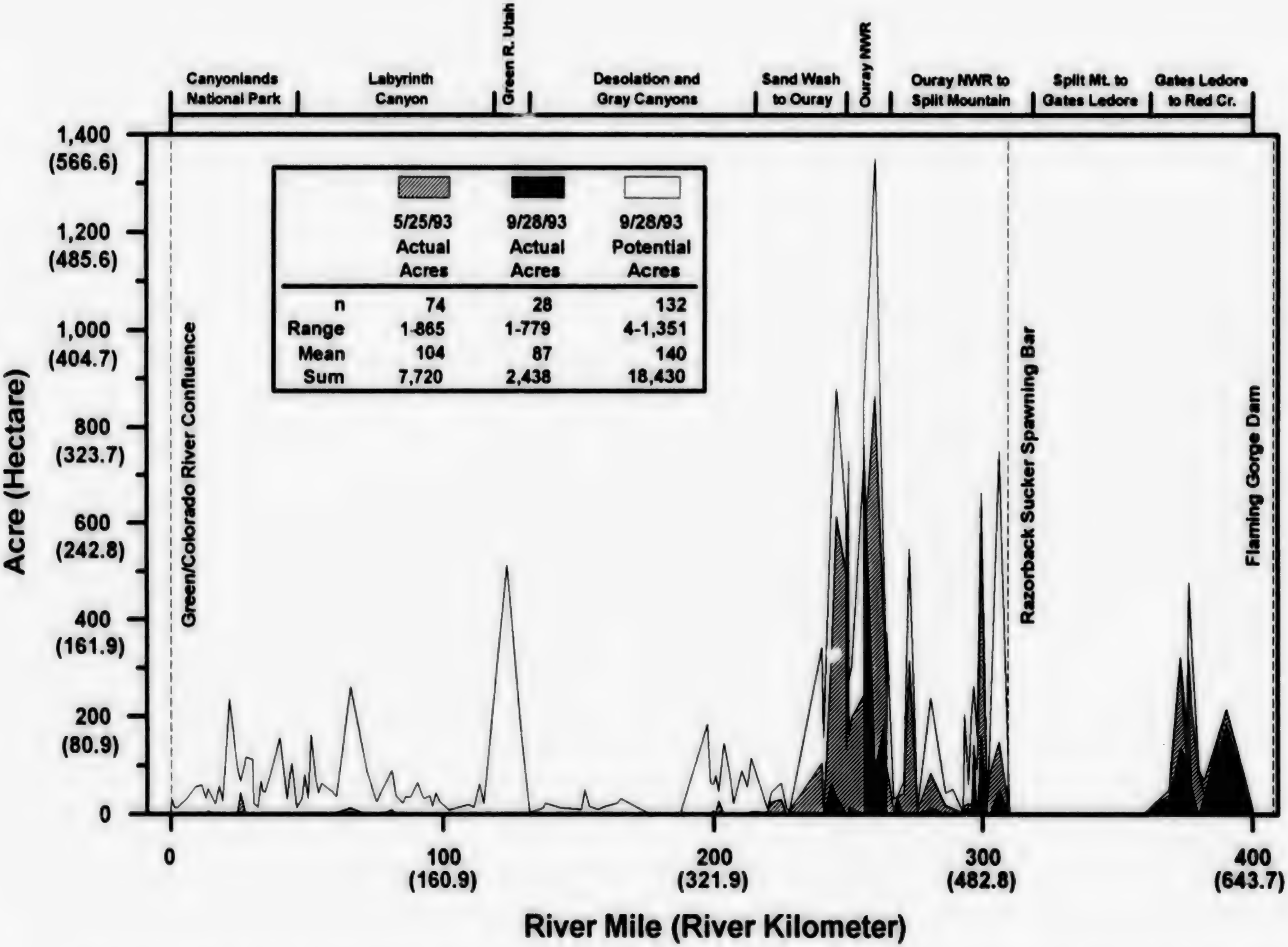


Figure 4. Actual and potential (historic floodplain) acres (hectares) of bottomland habitat adjacent to the Green River, Colorado and Utah, 1993.

2 = minor importance
1 = no preference

Each team member, assigned a point value for each selection criterion. The point values of team member were totaled and averaged. The average was rounded to the nearest whole number to give a total average point value. Next, the selection criteria were classified with the highest total average point value being the most important selection criteria and the lowest total average point value being the least important criteria (Table 1).

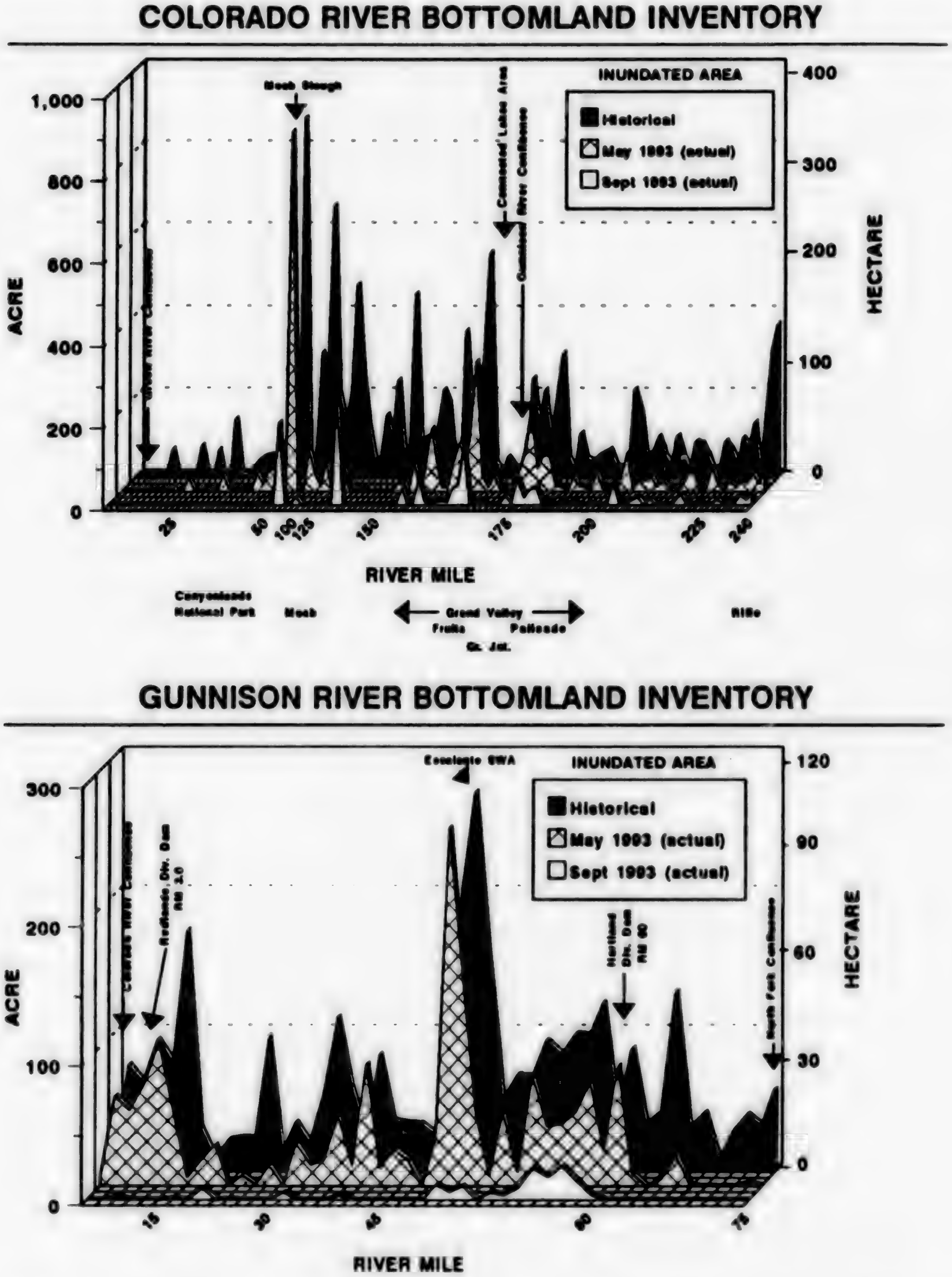


Figure 5. Areas inundated during high water (May and June) and low water (September) in 1993 compared with areas that historically flooded on 240 miles of the Colorado River from the Green River confluence upstream to Rifle, Colorado and 75 miles of the Gunnison River from the Colorado River confluence upstream to the North Fork confluence. Inundated areas include floodplain depressions and terraces, side channels, canyon mouths, and artificial habitats such as gravel-pit ponds. There were 110 sites inventoried on the Colorado River and 48 sites on the Gunnison River.

the equation is the three point values assigned the criterion by each team member. The product of the equation or 3.3 is the average weighted point value of the selected criterion.

[c] The total average point value is the sum of the average weighted point values for each selected criterion. (These values were rounded to the nearest whole number.)

25

received water from groundwater sources.

Along the 110 potential bottomland sites, we estimated 13.4 miles (21.6 km) of natural levees and 26.6 miles (42.9 km) of human-made dikes and levees. Of the various bottomland habitat types, 41 were floodplain terraces, 23 gravel-pit ponds, 22 side channels, and 16 canyon mouths. The remaining flooded habitat types consisted of 13 floodplain depressions and one oxbow. All 13 depressions were located between Moab Slough and the Green River confluence. Three of these depression habitat sites (rm 50.9-52.5 [rkm 82-84], rm 33.2-35.6 [rkm 53-57], and rm 17.5-18.7 [rkm 28-30]), may be important off-channel habitats for razorback sucker drifting downstream if an expected or planned upstream spawning area is identified. Although these areas are wet during high water, they appear isolated from the river in photos and water enters only by groundwater infiltration and, therefore, fish do not have access to these areas. Further on-ground investigation of these areas is needed to determine water depth during runoff to monitor water duration, and to evaluate if fish can access these areas during high water.

Gunnison River. There were 48 bottomland habitat sites with a potential (historical) of 3,227 acres (1,306 ha) along the Gunnison River (rm 0-75 [rkm 0-121]) in 1993 (Appendix D; Table D.2.). Of this total, 828 acres (335 ha; 41 sites) were inundated during the May and June high water period and 161 acres (459 ha) in the September low-water flow period.

In the Gunnison River, there was only one general area where bottomland habitats were concentrated. This was in the 17-mile stream reach in the Delta, Colorado, area that extends from Roubideau Creek upstream to Austin (rm 50-67 [rkm 81-108]). There were 1,739 acres (705 ha) of potential floodplain habitat in this 17-mile reach. The remaining 50 miles of warmwater stream reach downstream of Roubideau Creek can be predominantly classified as canyon-bound with few bottomland habitat sites.

Eighty-five percent of the 41 sites flooded in May had a hydrological connection to the river, whereas 76% (13 sites) of the 17 sites still wet in September were connected to the river (Appendix E; Tables E.14 to E.16.). Although 41 of 48 sites were inundated during May and June, only 17 sites had one surface connection to the river and 16 sites had both and up- and downstream surface connection. Thirteen of the May flooded sites received some water from a gravity-fed (irrigation) water source.

Along the 48 potential bottomland sites, we estimated 1.2 miles (2 km) of natural levees and 8.3 miles (13.4 km) of human-made dikes and levees. Of the various bottomland habitat types, 35 were floodplain terraces, six gravel-pit ponds, three oxbows, and two side channels. The remaining habitat types consisted of one floodplain depression and one canyon mouth.

Site Scoring and Prioritization

All bottomland habitat sites identified, 135 in the Green River Drainage (Appendix F; Table F.1.) and 158 in the Colorado River drainage (Appendix F;

inventory. The Green River drainage was scored and prioritized independently from the Colorado and Gunnison river drainages.

Geomorphology

Three general geomorphological categories were used to simplify bottomland classification and identify habitat types. These categories were floodplain depression, floodplain terrace, or gravel-pit pond (Figure 2). These three categories were the most numerous encountered in the inventory, although there were other habitat types such as canyon mouths.

Table F.2.), were scored and ranked according to the five-step prioritization procedure.

Green River Drainage

There were 132 bottomland habitat sites inventoried in the Green, one site in the Yampa, and two sites in the White River. The highest rank was "1" and the lowest rank "19". Bottomland habitats between Pariette Draw and Escalante Ranch (32 sites, rm 238-310 [rkm 383-499]) were the top ranked sites (1-11)(Table 2; Figure 6). There were tie-scores for several sites; hence several sites had identical ranks. Bottomland habitats in the Ouray National Wildlife Refuge (6 sites, rm 249-265 [rkm 401-427]) contained the highest ranked (1st and 2nd) sites. The Browns Park National Wildlife Refuge (8 sites, rm 368-393 [rkm 592-633]) sites ranked 12th-14th, followed by lower ranked (17th-18th) sites from Pariette Draw downstream to the Green and Colorado river confluence (92 sites, rm 0-238 [rkm 0-383]). The one Yampa

Table 2. The top 11 ranked bottomland sites adjacent to the Green River (GR), 1993. Refer to Appendix F; Tables F-1 to F-3 for a complete list of ranked sites in the Green River sub-basin.

Rank	General Area	Site Description	River: River Mile
1	Pariette Draw to Escalante Ranch	Johnson Bottom, Ouray NWR	GR: 263.0-265.0
1	Pariette Draw to Escalante Ranch	Leota Pond Complex, Ouray NWR	GR: 257.0-262.0
2	Pariette Draw to Escalante Ranch	Little Stewart Lake	GR: 295.5-297.5
2	Pariette Draw to Escalante Ranch	Brennan Bottom	GR: 262.0-266.0
2	Pariette Draw to Escalante Ranch	Wyasket Lake, Ouray NWR	GR: 253.0-257.0
2	Pariette Draw to Escalante Ranch	Sheppard Bottom, Ouray NWR	GR: 254.0-256.0
2	Pariette Draw to Escalante Ranch	Old Charlie Wash (main)/Woods Bottom, Ouray NWR	GR: 249.0-252.0
2	Pariette Draw to Escalante Ranch	Old Charlie Wash (diked)/Woods Bottom, Ouray NWR	GR: 249.0-250.0
3	Pariette Draw to Escalante Ranch	Stewart Lake	GR: 299.0-300.0
3	Pariette Draw to Escalante Ranch	Ashley Creek confluence area	GR: 297.0-298.5
4	Pariette Draw to Escalante Ranch	Escalante Ranch	GR: 302.5-309.5
4	Pariette Draw to Escalante Ranch	Meril Snow Ranch	GR: 302.0-303.0
4	Pariette Draw to Escalante Ranch	Gravel Ponds at Jensen	GR: 301.0-302.0
4	Pariette Draw to Escalante Ranch	Spring Hollow	GR: 295.0-296.0
5	Pariette Draw to Escalante Ranch	Bonanza Bridge Area	GR: 288.5-289.0
5	Pariette Draw to Escalante Ranch	Collier Draw	GR: 285.5-286.5
6	Pariette Draw to Escalante Ranch	Walker Hollow	GR: 294.0-295.0
6	Pariette Draw to Escalante Ranch	Alhandra Ferry Site	GR: 292.0-294.0
6	Pariette Draw to Escalante Ranch	Gravel Pits	GR: 292.0-293.0
7	Pariette Draw to Escalante Ranch	Mouth of Willow Creek	GR: 239.0-241.0
7	Pariette Draw to Escalante Ranch	Pariette Draw	GR: 238.0-241.0
8	Pariette Draw to Escalante Ranch	Downstream of Baeser Bend	GR: 269.0-272.0
8	Pariette Draw to Escalante Ranch	Upstream of Brennan Bottom	GR: 267.0-269.0
8	Pariette Draw to Escalante Ranch	Upstream of Brennan Bottom	GR: 266.0-267.0
8	Pariette Draw to Escalante Ranch	Ouray Ute pasture land	GR: 248.0-251.0
8	Pariette Draw to Escalante Ranch	Duchesne River confluence area	GR: 248.0-249.0
8	Pariette Draw to Escalante Ranch	White River confluence area	GR: 248.0-249.0
8	Pariette Draw to Escalante Ranch	West Branch area	GR: 243.0-247.0
8	Pariette Draw to Escalante Ranch	Tia Juana Bottom	GR: 242.0-244.0
9	Pariette Draw to Escalante Ranch	Hamacker Bottom/Baeser Bend	GR: 271.0-274.0
10	Pariette Draw to Escalante Ranch	The Stirrup	GR: 274.0-277.0
11	Pariette Draw to Escalante Ranch	Horseshoe Bend Area	GR: 277.0-284.0

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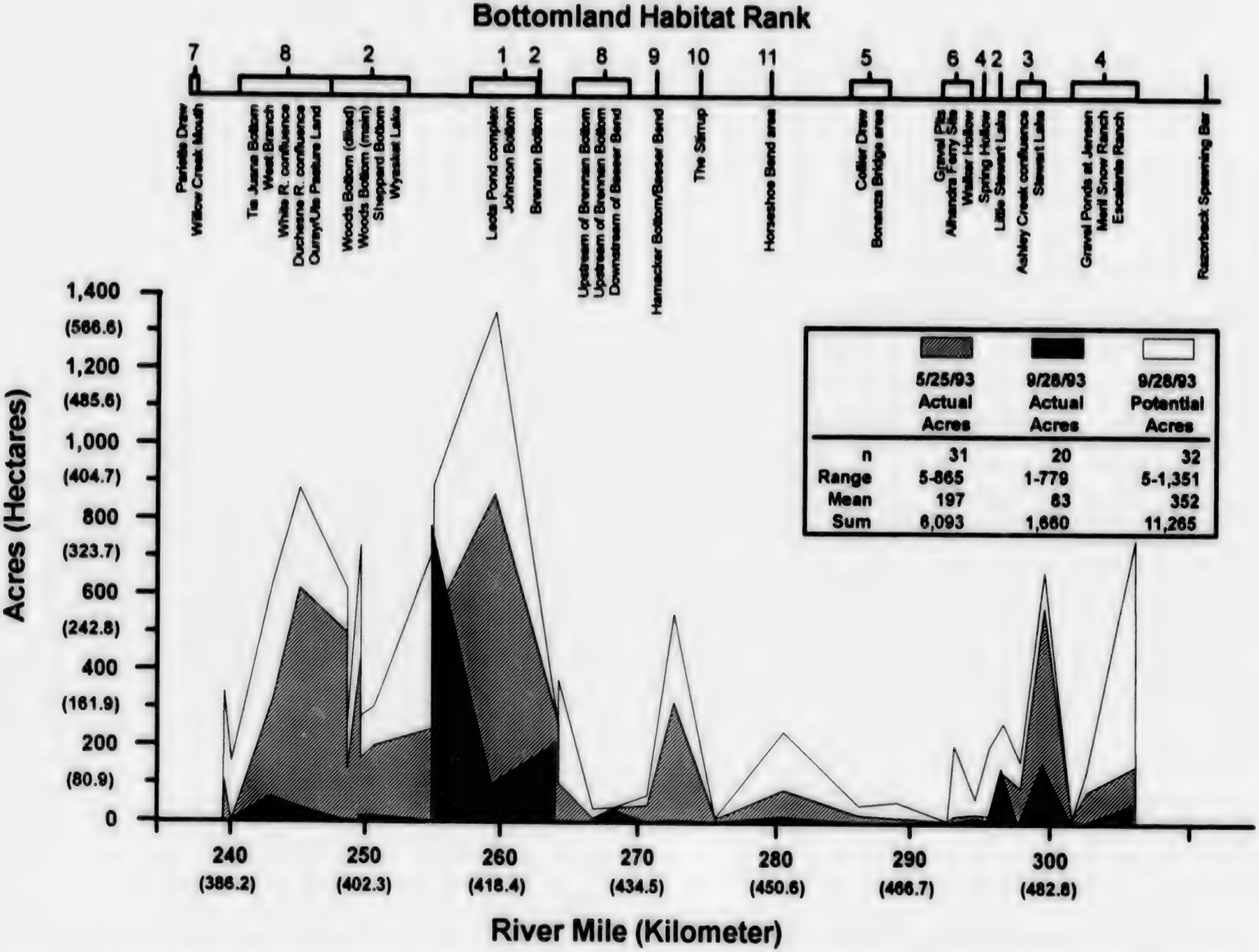

	▨ 5/25/93 Actual Acres	■ 9/28/93 Actual Acres	□ 9/28/93 Potential Acres
n	31	20	32
Range	5-865	1-779	5-1,351
Mean	197	83	352
Sum	6,093	1,660	11,265

Figure 6. Actual and potential (historic floodplain) acres (hectares) of the top eleven ranked bottomland habitat sites adjacent to the Green River, Utah, 1993.

River site ranked the lowest (19th), whereas the two White River sites ranked in the middle (oxbow: 15th; confluence: 10th).

Based on these rankings, there are five bottomland habitat areas in the Green River. The top ranked areas are in the Ouray National Wildlife Refuge, the next ranked areas in the Jensen to Brennan Bottom, followed by sites downstream of Ouray. The lowest ranked sites are in the Browns Park National Wildlife Refuge and the area from Desert Spring and Moon Bottom to the Green and Colorado river confluence.

Colorado River Drainage

There were 110 bottomland habitat sites inventoried in the Colorado River and 48 sites in the Gunnison River. The highest rank was "1" and the lowest "28". Unlike the Green River drainage, the top 13 ranked sites were scattered among four general areas (Table 3; Figure 7). Several bottomland sites had identical scores (rank 8th and 12th-two sites each; rank 9th and

Table 3. The top 13 ranked bottomland sites adjacent to the Colorado (CO) and Gunnison (GU) rivers, 1993. Refer to Appendix F; Tables F-4 to F-10 for a complete list of ranked sites in the Colorado River sub-basin.

Rank	General Area	Site Description	River: River Mile
1	18-mile Reach	Walter Walker State Wildlife Area	CO: 162.7-165.1
2	Delta Area	Johnson Boy's Slough	GU: 53.2- 54.2
3	15-mile Reach	Clifton Pond Area	CO: 177.7-178.2
4	Debeque Area	Debeque I-70 Slough	CO: 209.6-211.4
5	15-mile Reach	Labor Camp	CO: 182.9-183.6
6	18-mile Reach	Panorama	CO: 163.1-163.6
7	Debeque Area	Stoddard Property	CO: 209.4-210.1
8	Delta Area	Escalante State Wildlife Area (North)	GU: 50.8- 52.9
8	Delta Area	Escalante State Wildlife Area (South)	GU: 50.2- 52.4
9	Debeque Area	Etter's	CO: 204.7-206.6
9	15-mile Reach	Humphrey's	CO: 175.3-176.6
9	15-mile Reach	Griffith's	CO: 174.1-176.5
9	Debeque Area	Latham's	CO: 207.9-208.8
9	Debeque Area	"No-name"	CO: 206.2-207.5
10	18-mile Reach	Walter Walker South	CO: 164.4-166.0
10	18-mile Reach	"No-name"	CO: 169.4-169.6
10	18-mile Reach	"No-name"	CO: 161.0-162.0
10	Debeque Area	Battlement Mesa	CO: 220.7-221.7
11	15-mile Reach	"No-name"	CO: 181.7-182.2
11	Debeque Area	"No-name"	CO: 202.3-204.2
11	Debeque Area	"No-name"	CO: 201.9-202.4
11	Debeque Area	EXXON	CO: 218.9-220.1
11	Debeque Area	Wallace Creek Island	CO: 215.9-216.5
12	15-mile Reach	"No-name"	CO: 183.3-184.2
12	15-mile Reach	"Hotspot Junction"	CO: 173.9-175.1
13	15-mile Reach	Clifton Water Treatment	CO: 179.1-181.1

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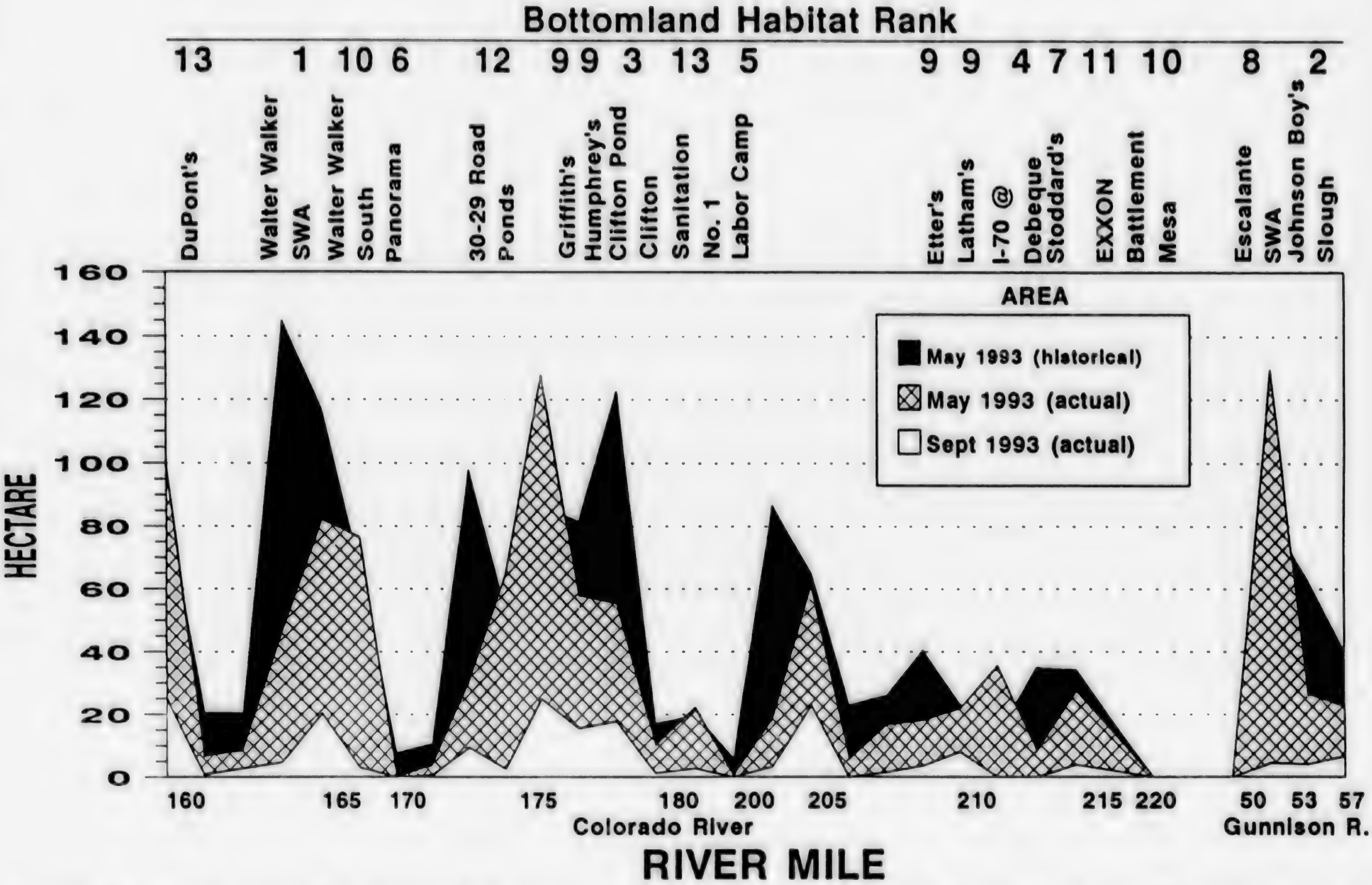

Figure 7. Areas inundated during high water (May and June) and low water (September) in 1993 compared with areas that were historically flooded for the top 13 ranked bottomland sites adjacent to the Colorado and Gunnison rivers.

11th-five sites each; rank 10th-four sites). Along the Colorado River, there were 10 bottomland habitat sites within the Debeque area (rm 202.3-221.7 [rkm 326-357]), eight sites within the 15-mile reach (rm 173.9-184.2 [rkm 280-297]), and five sites within the 18-mile reach (rm 161.0-169.6 [259-273])(Table 3). There were three sites within the Delta area along the Gunnison River (rm 50.2-54.2 [rkm 81-87]).

The top ranked site was the Walter Walker State Wildlife Area in the 18-mile reach. Four other sites in the immediate vicinity ranked 6th and 10th. Johnson Boy's Slough along the Gunnison River ranked 2nd, the Clifton Pond area along the Colorado River ranked 3rd, and the Debeque I-70 Slough ranked 4th. Six other sites immediately downstream of the Debeque I-70 Slough ranked 9th and 11th.

Ecology

The wetland studies of the five initial bottomland sites conducted by Cooper and Severn (Table 4) were completed in 1993. Each site was unique and had varying levels of restoration potential. The bottomland habitat areas in Ouray National Wildlife Refuge, the Escalante State Wildlife Area, and the 29-5/8 Road gravel-pit pond have the greatest potential for razorback sucker restoration. The Escalante Ranch area and Moab Slough may require significant modification for restoration.

Hydrology

Green River Drainage

Stage vs. Discharge Relationship. Staff gauges were installed at seven different bottomland sites from mid-May (5/11) through late-June (6/28) and monitored for 34 to 48 days to obtain stage-discharge data during the high-flow period (Figures 8-14). Spring runoff in the Green, Yampa, and White rivers was moderately low in 1994 compared to moderately high flows in these rivers in 1993.

The maximum daily mean discharge in 1994 was 11,068 cfs on 20 May for the Green River at the Jensen stream gauge, 5,650 cfs on 18 May for the Yampa River at the Maybell gauge, and 2,529 cfs on 23 May for the White River at the Watson gauge. In 1993, the maximum daily mean discharge was 20,000 cfs for the Green River, 17,870 cfs for the Yampa River, and 4,570 cfs for the White River.

Stage-discharge data recorded at temporary staff-gauge sites were collected over a narrow range and at a lower magnitude of flows in 1994 compared to previous higher water years (Table 5). Flows in 1994 were lower than anticipated making it difficult to develop a reliable stage vs. discharge relationship.

The linear regression correlation coefficients (r^2) of the stage vs. discharge relationships were high (range of 0.83 to 0.97) at six of the seven [rkm 303-328]).

Seventy-one percent (71 sites) of the 100 sites flooded in May had a hydrological connection to the river, whereas 77% (43 sites) of the 56 sites still wet in September were connected to the river (Appendix E; Tables E.7. to E.13.) Although 71 sites were inundated during May and June, 26 sites had only one surface connection to the river and 15 sites had both an up- and downstream surface connection. Twenty-one percent of the May flooded sites received some water from gravity-fed (irrigation) water sources and 56%

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Table 4. Brief description of the five bottomland sites selected for demonstration projects in the Colorado and Green river drainages, Colorado and Utah.

River Bottomland Site	Reference	Comments/Recommendations
Colorado River		
Moab Slough	Cooper and Severn 1994a	Higher flows are necessary to inundate the bottomland habitat in Moab Slough. Razorback sucker larvae will also need to be introduced into the site. The area needs to receive seasonal flooding to flush out high concentrations of salt. Significant earthwork may be necessary to make the area fully functional.
29-5/8 Road Gravel Pit	Cooper and Severn 1994b	This pond could provide important fish habitat. No need to grade the pond bottom; break the dike and create a permanent access, let the pond fill and drain with natural river flows, and let fish move in and out throughout the year. Some periodic maintenance to keep the entrance or connection channel free of sediment may be necessary.
Gunnison River		
Escalante State Wildlife Area	Cooper and Severn 1994c	This site has as much potential for restoration as any other site in the Upper Colorado River Basin. It is dynamic and fluvially active, with fully functioning backwaters and oxbows and has areas that can be slightly modified to increase their functioning as bottomland habitat. If selenium in the Gunnison River and all irrigation and tributary flows remains high and it cannot be remediated, this may preclude use of the system in this recovery program.
Green River		
Ouray National Wildlife Refuge (Old Charlie Wash)	Cooper and Severn 1994d	Potentially one of the most valuable flood plain ecosystems in the entire Upper Colorado River Basin. Extensive bottomland areas occur behind natural and man-made levees adjacent to the main river channel. The greatest potential for re-coupling of the river with the flood plain occurs at the Ouray National Wildlife Refuge. Needs higher flows over a longer duration released from Flaming Gorge Dam.
Escalante Ranch area	Cooper and Severn 1994e	Contains localized concentrations of selenium, particularly in the northern and southern portions of the bottomland area. These areas may have selenium concentrations too high for fish restoration purposes. Channels may need to be constructed in some areas of the wetland to allow high water flushing flows to reduce selenium levels. This flooding may also provide an avenue for larval razorback suckers to enter the wetland.

Figure 5. Areas inundated during high water (May and June) and low water (September) in 1993 compared with areas that historically flooded on 240 miles of the Colorado River from the Green River confluence upstream to Rifle, Colorado and 75 miles of the Gunnison River from the Colorado River confluence upstream to the North Fork confluence. Inundated areas include floodplain depressions and terraces, side channels, canyon mouths, and artificial habitats such as gravel-pit ponds. There were 110 sites inventoried on the Colorado River and 48 sites on the Gunnison River.

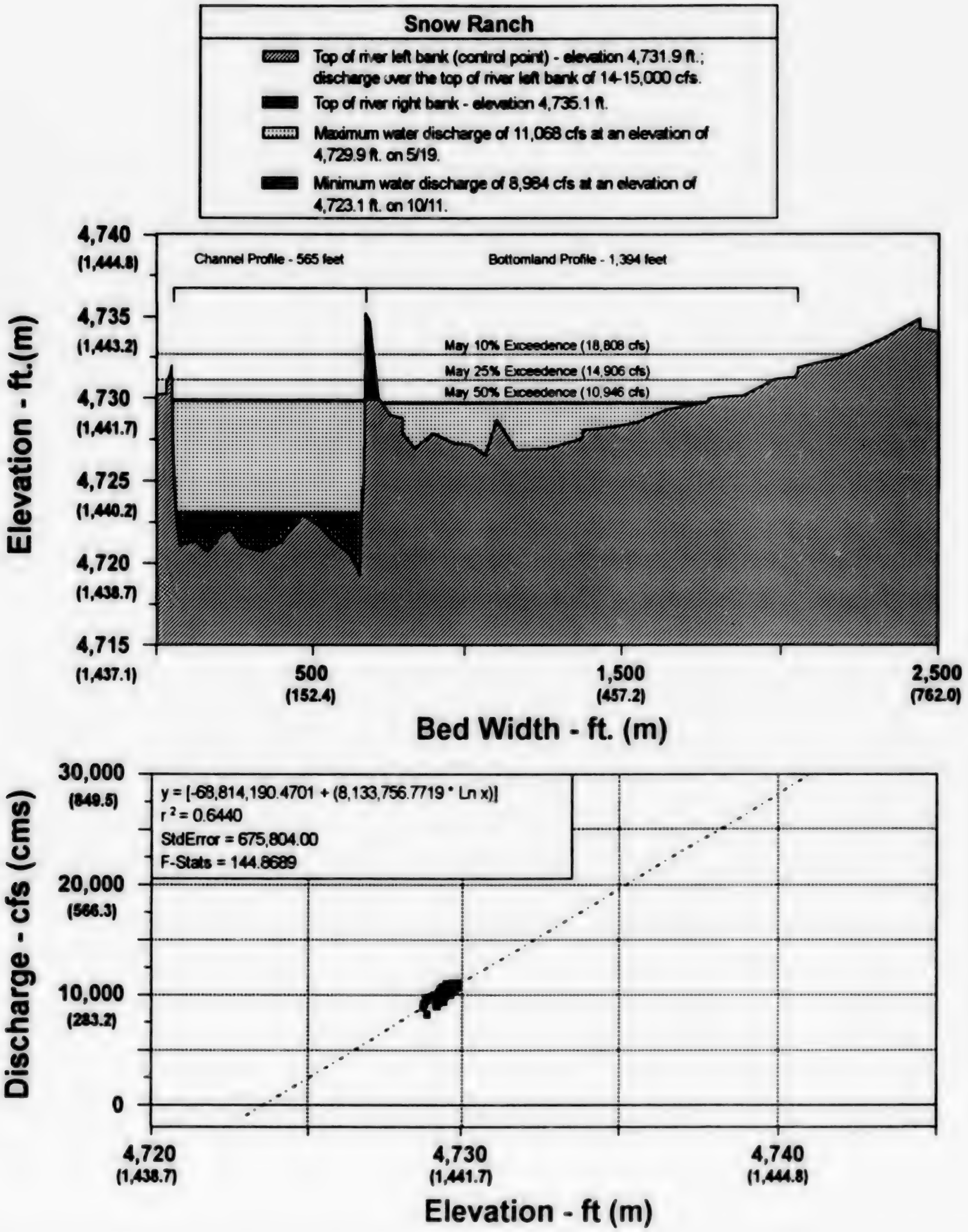

Figure 8. River profile and stage versus discharge relationship for the Meril Snow Ranch bottomland habitat site adjacent to the Green River, Utah, 1994.

downstream surface connection. Thirteen of the May flooded sites received some water from a gravity-fed (irrigation) water source.

Along the 48 potential bottomland sites, we estimated 1.2 miles (2 km) of natural levees and 8.3 miles (13.4 km) of human-made dikes and levees. Of the various bottomland habitat types, 35 were floodplain terraces, six gravel-pit ponds, three oxbows, and two side channels. The remaining habitat types consisted of one floodplain depression and one canyon mouth.

Site Scoring and Prioritization

All bottomland habitat sites identified, 135 in the Green River Drainage (Appendix F; Table F.1.) and 158 in the Colorado River drainage (Appendix F;

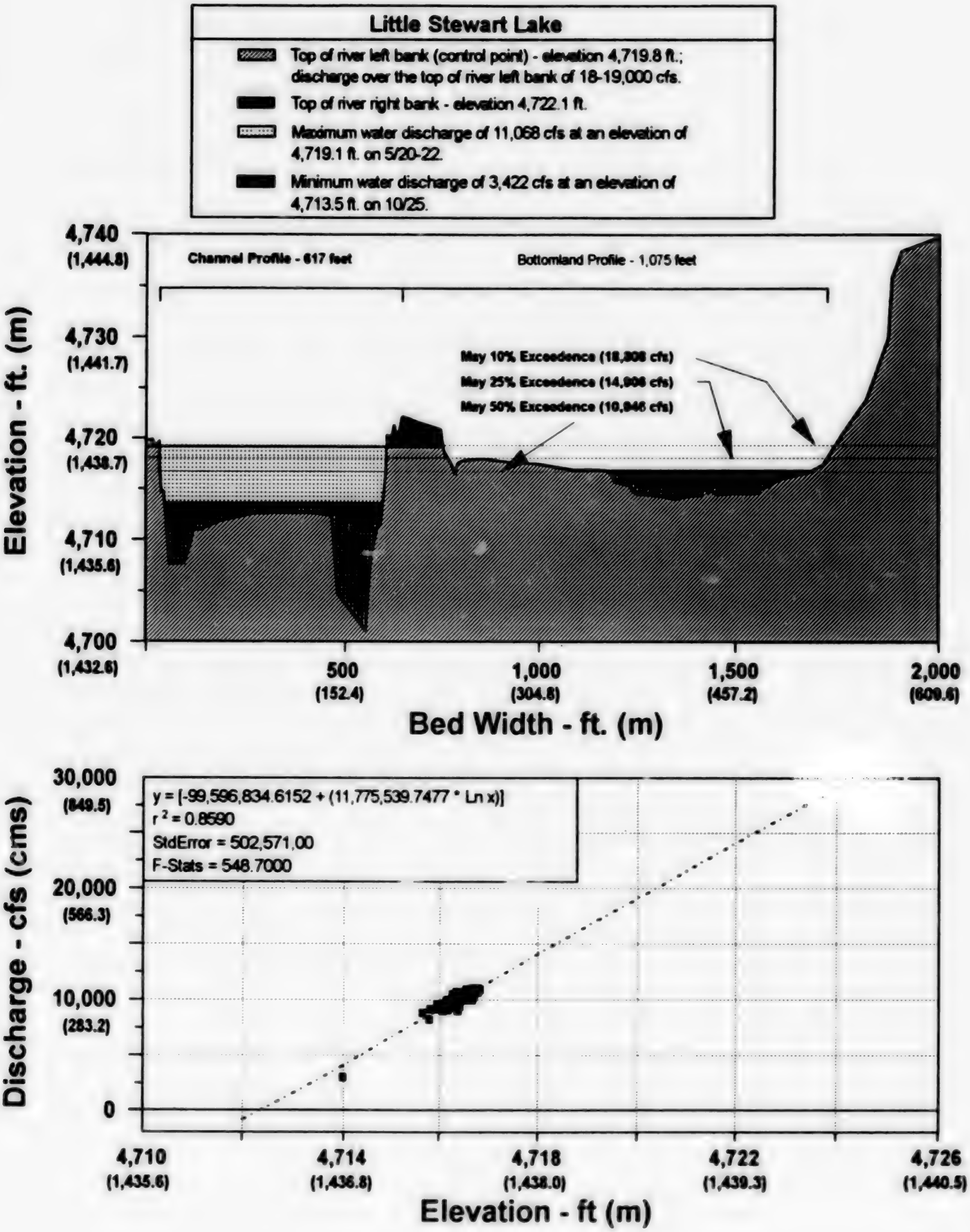

Figure 9. River profile and stage versus discharge relationship for the Little Stewart Lake bottomland habitat site adjacent to the Green River, Utah, 1994.

6	Pariette Draw to Escalante Ranch	Walker Hollow	GR: 294.0-295.0
6	Pariette Draw to Escalante Ranch	Alhandra Ferry Site	GR: 292.0-294.0
6	Pariette Draw to Escalante Ranch	Gravel Pits	GR: 292.0-293.0
7	Pariette Draw to Escalante Ranch	Mouth of Willow Creek	GR: 239.0-241.0
7	Pariette Draw to Escalante Ranch	Pariette Draw	GR: 238.0-241.0
8	Pariette Draw to Escalante Ranch	Downstream of Baeser Bend	GR: 269.0-272.0
8	Pariette Draw to Escalante Ranch	Upstream of Brennan Bottom	GR: 267.0-269.0
8	Pariette Draw to Escalante Ranch	Upstream of Brennan Bottom	GR: 266.0-267.0
8	Pariette Draw to Escalante Ranch	Ouray Ute pasture land	GR: 248.0-251.0
8	Pariette Draw to Escalante Ranch	Duchesne River confluence area	GR: 248.0-249.0
8	Pariette Draw to Escalante Ranch	White River confluence area	GR: 248.0-249.0
8	Pariette Draw to Escalante Ranch	West Branch area	GR: 243.0-247.0
8	Pariette Draw to Escalante Ranch	Tia Juana Bottom	GR: 242.0-244.0
9	Pariette Draw to Escalante Ranch	Hamacker Bottom/Baeser Bend	GR: 271.0-274.0
10	Pariette Draw to Escalante Ranch	The Stirrup	GR: 274.0-277.0
11	Pariette Draw to Escalante Ranch	Horseshoe Bend Area	GR: 277.0-284.0

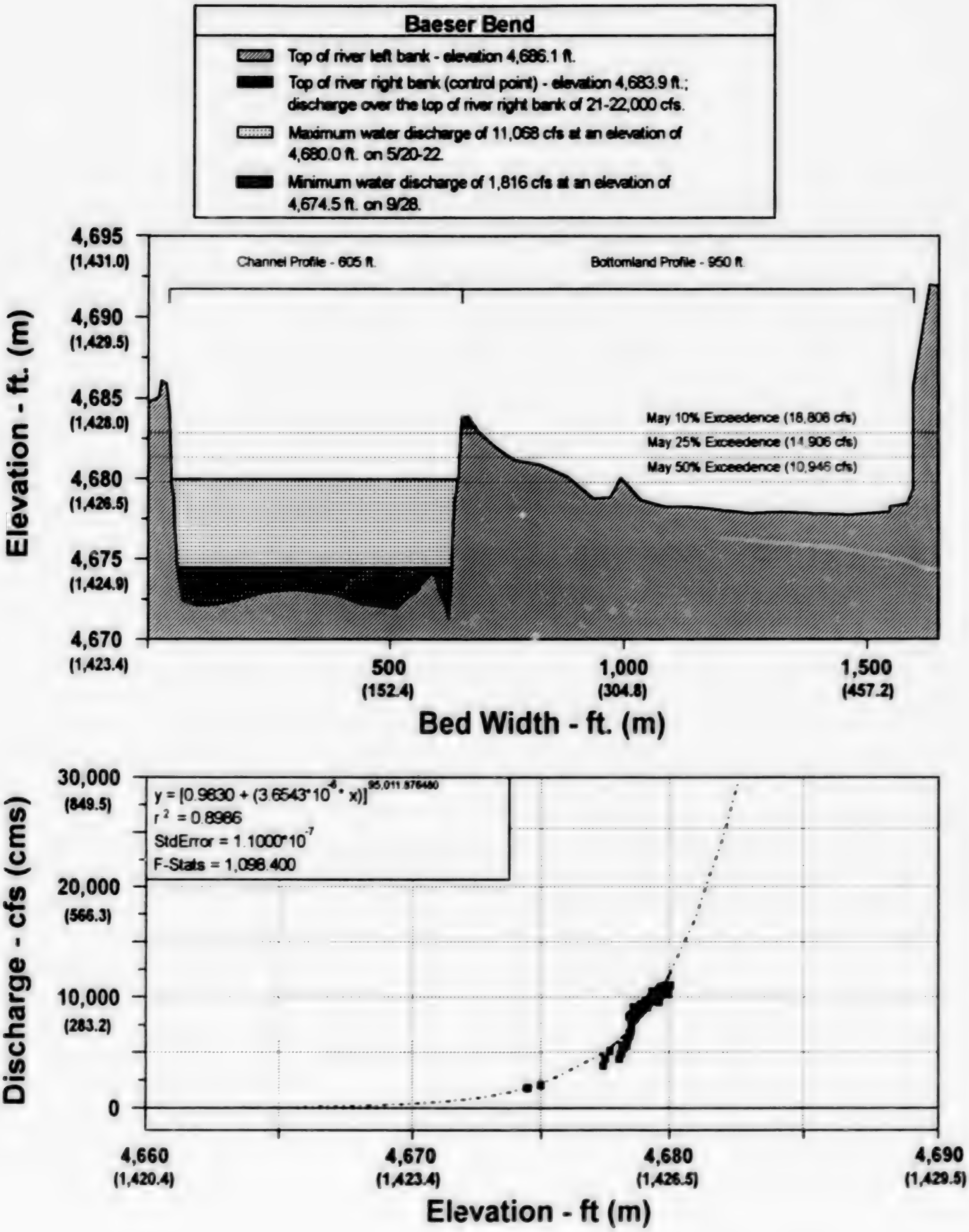

Figure 10. River profile and stage versus discharge relationship for the Baeser Bend bottomland habitat site adjacent to the Green River, Utah, 1994.

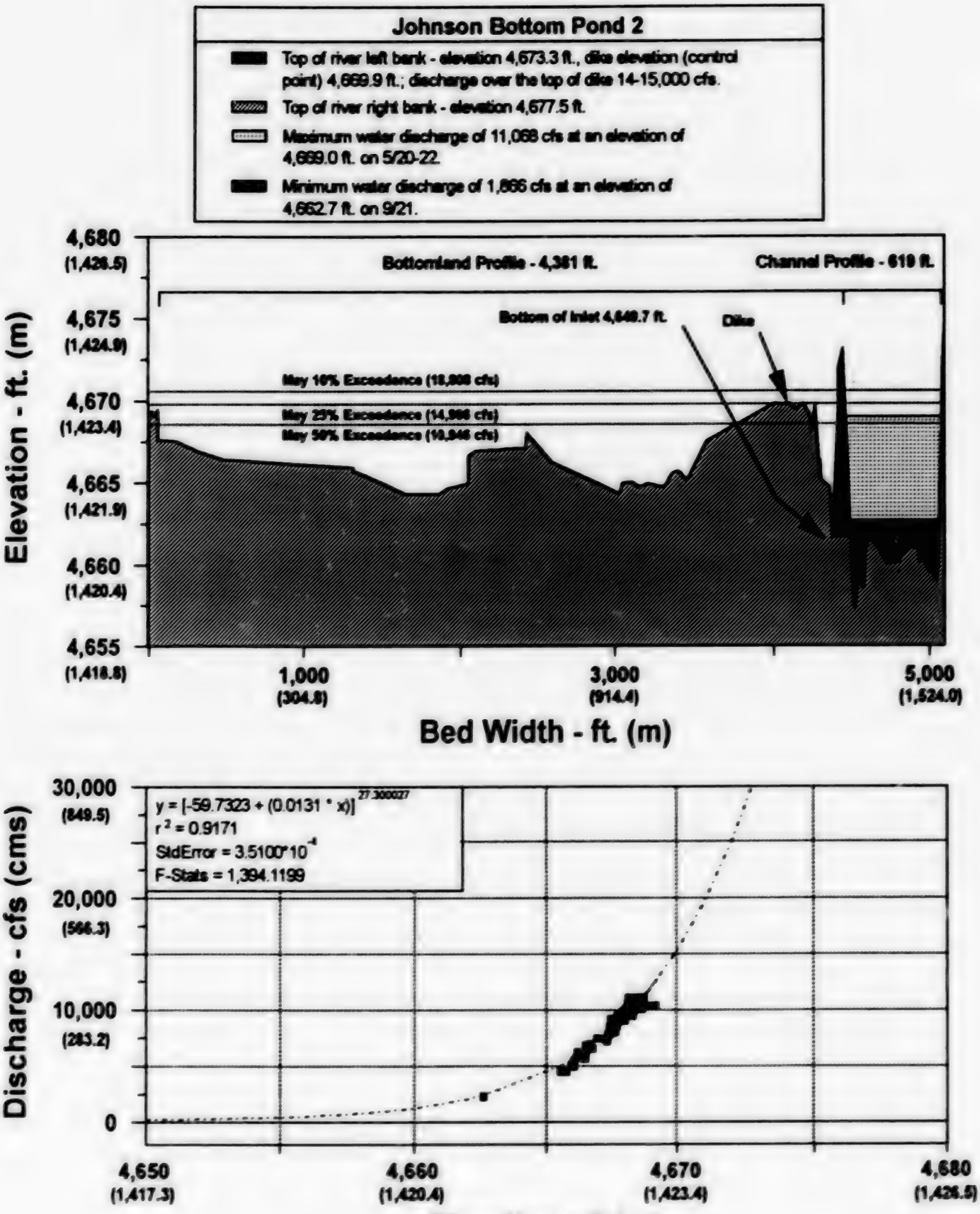

Figure 11. River profile and stage versus discharge relationship for the Johnson Bottom pond 2 bottomland habitat site adjacent to the Green River, Utah, 1994.

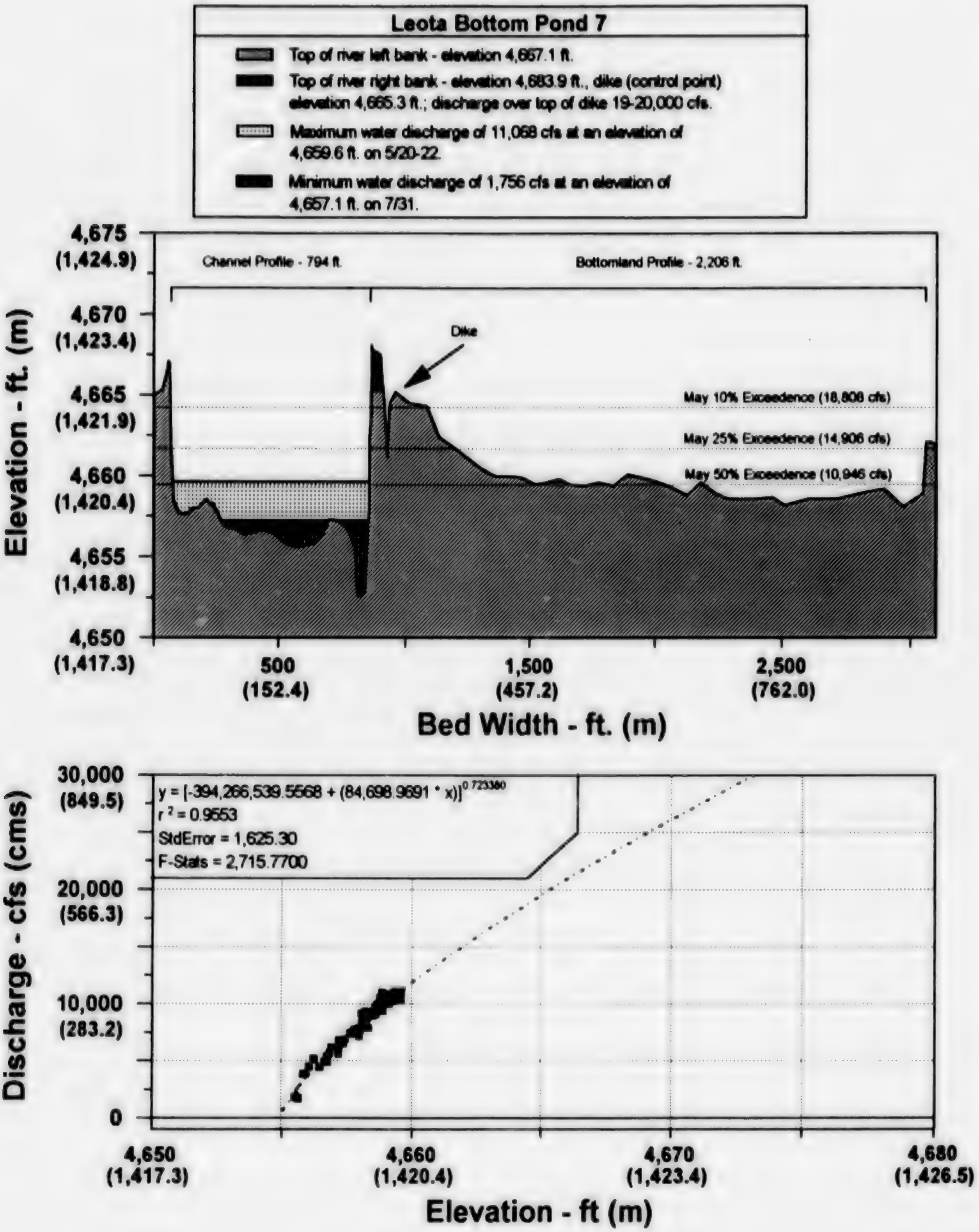

Figure 12. River profile and stage versus discharge relationship for the Leota Bottom Pond 7 bottomland habitat site adjacent to the Green River, Utah, 1994.

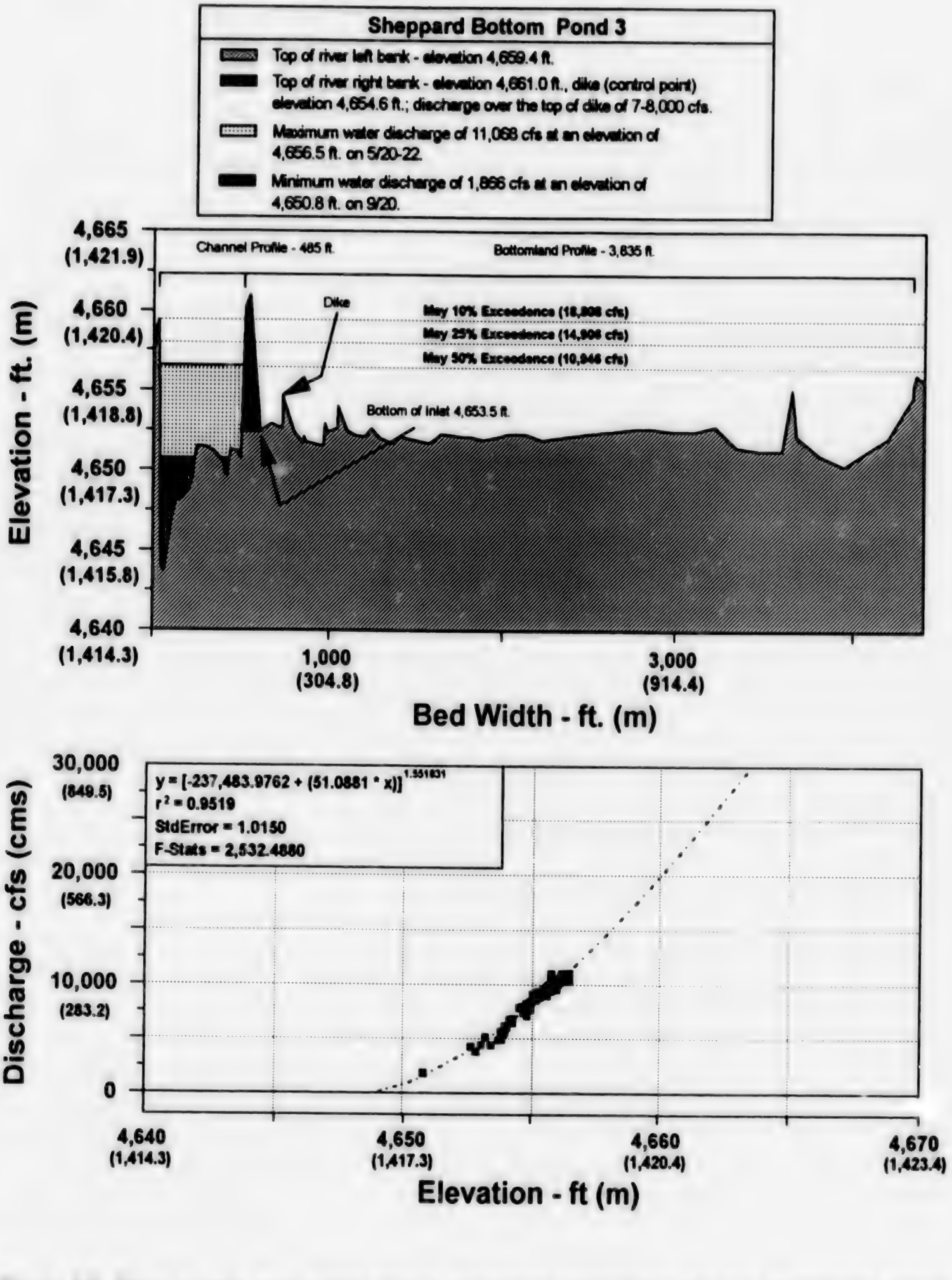

Figure 13. River profile and stage versus discharge relationship for the Sheppard Bottom Pond 3 bottomland habitat site adjacent to the Green River, Utah, 1994.

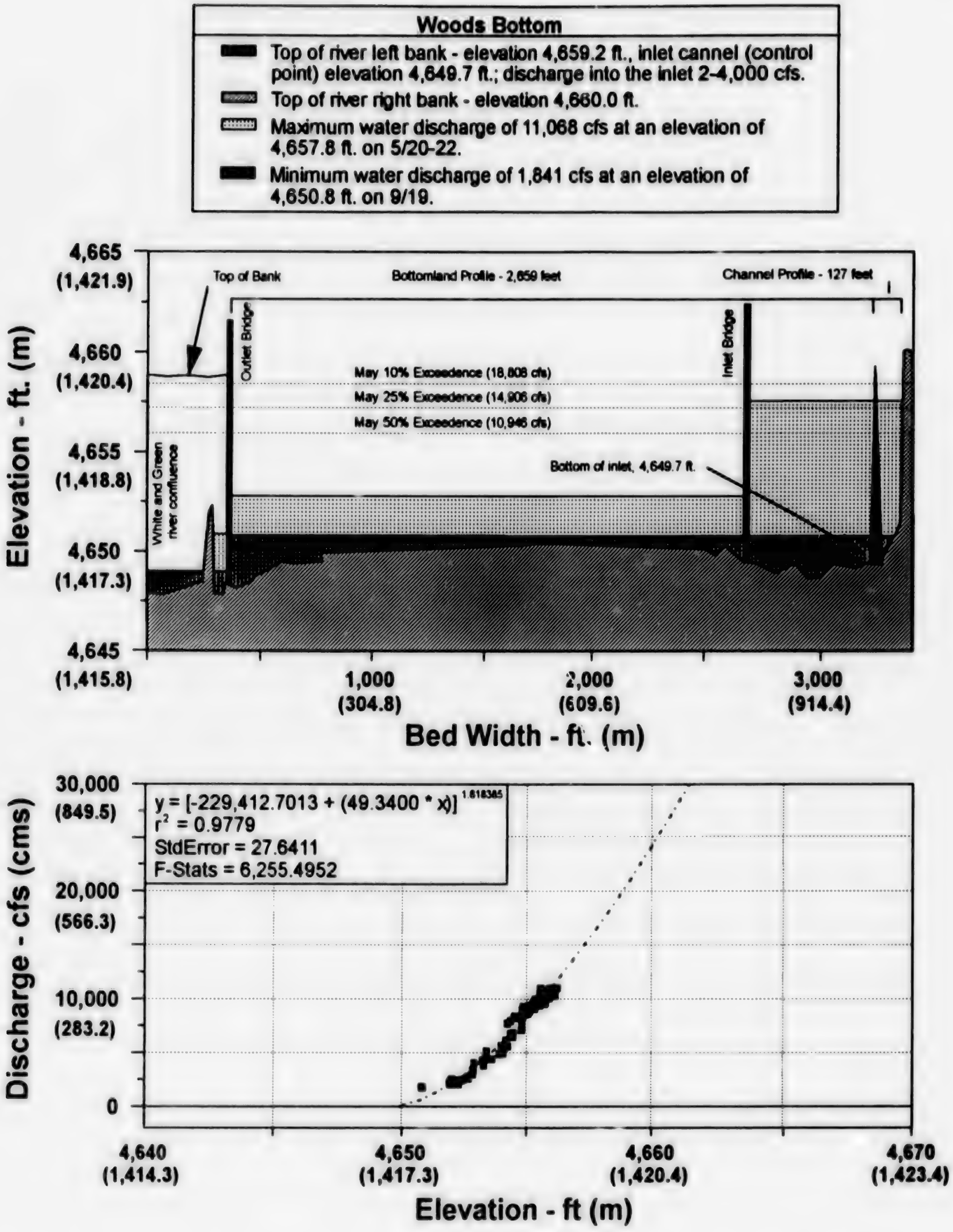

Figure 14. River profile and stage versus discharge relationship for the Woods Bottom (Old Charlie Wash) bottomland habitat site adjacent to the Green River, Utah, 1994.

sites. It was unfortunate, however, that high runoff flows were not available in 1994 to accurately predict the stage vs. discharge relationship. A larger data base is needed to more accurately verify the predicted stage vs. discharge relationship for the upper end of the May and June hydrograph. This is especially important when estimating the magnitude, frequency, and duration of flows necessary to flood a bottomland site.

Table 5. Range of flows and dates that stage-discharge data were collected in the Green River drainage, 1994.

Site	1994 Flows (cfs)	Dates MM/DD	Maximum Discharge (cfs)	
			1994	1993
Meril Snow Ranch	2,834-11,068	5/13-6/17	11,068	20,000
Little Stewart Lake	2,834-11,068	5/13-6/17	11,068	20,000
Baeser Bend	2,110-11,068	5/12-6/28	11,068	20,000
Johnson Bottom Pond 2	4,443-11,068	5/11-6/14	11,068	20,000
Leota Bottom Pond 7	3,645-11,068	5/11-6/15	11,068	20,000
Sheppard Bottom Pond 3	3,645-11,068	5/12-6/15	11,068	20,000
Woods Bottom	2,110-11,068	5/12-6/28	11,068	20,000

Channel Cross Sections. Channel cross sections at each of the seven bottomland sites were conducted in August, September, and October (Figures 8-14). The river channel widths ranged from 127 to 794 feet (39-242 m) and the bottomland sites ranged from 950 to 4,381 feet (290-1,335 m). The widest wetted cross section was at Johnson Bottom (4,381 feet [1,335 m]) and the narrowest cross section was at Baeser Bend (950 feet [290 m]) on the Green River.

Using the stage vs. discharge and flow-frequency data (Appendix I; Figure I.1.), the flow necessary to flood the particular bottomland (floodplain depression) for all seven sites was estimated (Table 6; Figures 8-14). For example, at the Meril Snow Ranch site (Green River rm 303.0 [rkm 487.6]) we estimated the floodplain depression would flood at about 14,000-15,000 cfs; these flows that might be experienced about one year out of three to four (since 1966). However, this site requires validation of the stage vs. discharge relationship because the correlation coefficient was the lowest of the seven sites ($r^2=0.64$). Re-establishing a staff gauge and obtaining another data set during runoff at all seven sites is necessary to refine the stage vs. discharge relationship and obtain more reliable estimates of overbank flooding.

Table 6. Estimated overbank flooding and frequency of flooding at the seven bottomland habitat sites in the Green River (GR). Overbank flooding was determined from staff vs. discharge relationships and river profiles conducted for each site in 1994. Flow percentile data for the post-water development period were taken from USGS stream gauging stations nearest the site.

Site River Mile	Estimated Overbank/ Side Channel Flooding (cfs)	Percent of Time[a] Flood Flows Are Available	USGS Stream Gauge/ Time Period Evaluated	
Meril Snow Ranch GR 303.0[b]	14,000-15,000	25- 35%	Jensen[b]	1966-1993
Little Stewart Lake GR 297.0	18,000-19,000	10- 15%	Jensen	1966-1993
Baeser Bend GR 271.5	19,000-20,000	5- 10%	Jensen	1966-1933
Johnson Bottom Pond 2 GR 262.0	12,000-13,000	40- 50%	Jensen	1966-1933
Leota Bottom Pond 7 GR 258.0	20,000-22,000	1- 5%	Jensen	1966-1993
Sheppard Bottom Pond 3 GR 251.0	7,000- 8,000	65- 70%	Jensen	1966-1993
Woods Bottom GR 252.0	2,000- 4,000	95-100%	Jensen	1966-1993

[a] For example 25-35% of the time = 2.5 to 3.5 years out of 10.

[b] USGS gauge at Jensen, Utah, rm 317 (rkm 510).

The Little Stewart Lake, Baeser Bend, and Leota Pond 7 bottomland sites would flood between 18,000-22,000 cfs; one year out of ten. The Little Stewart Lake site has an old inlet ditch just upstream that could flood between 6,000-7,000 cfs every other year. Removal of about five feet of bank at the Baeser Bend site would allow flooding between 10,000-11,000 cfs every other year. The Johnson Pond 2 bottomland site would flood into the inlet ditch between 12,000-13,000, two years out of five. The Sheppard Bottom pond 3 site would flood into the inlet ditch between 7,000-8,000 cfs, seven years out of ten. The Woods Bottom site would flood into the inlet ditch between 2,000-4,000 cfs, nine out of 10 years.

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Colorado River Drainage

Stage vs. Discharge Relationship. Nine staff gauges were installed at nine different bottomland sites during mid-May and monitored for approximately 45 days to obtain stage vs. discharge information for flows during the high-flow period (Figures 15-22). Information for one site (Pike's, Colorado River rm 179.1 [rkm 288]) was not useable because livestock repeatedly disturbed the position of the camera; at two other sites (Griffith's, Colorado River rm 176.0 [rkm 283]) and Clifton Sanitation No. 1., Colorado River rm 178.5 rkm 287]) the period of time information was collected was prematurely terminated because the cameras were stolen. Spring runoff in the Colorado and Gunnison rivers was moderately low in 1994 compared to 1993 which was considered a moderately high year. The maximum daily mean discharge recorded during 1994 for the Colorado River at the Stateline USGS gauge was 13,700 cfs on 2 June, whereas in the Gunnison River the maximum daily mean discharge at the Whitewater gauge was recorded at 6,040 cfs on 23 May. In 1993, the maximum daily mean discharge recorded for the Colorado River at the Stateline gauge was 44,000 cfs; in the Gunnison River the maximum daily mean discharge was 20,500 cfs.

Empirical stage data were collected over a narrow range and at a lower magnitude of flows in 1994 compared to previous higher water years (Table 7). Flows in 1994 were lower than anticipated to obtain a reliable stage vs. discharge relationship.

Table 7. Range or flows and dates that stage-discharge data were collected in the Colorado and Gunnison river drainages, 1994.

Site	Flows (cfs)	Date MM/DD	Maximum Discharge (cfs) 1994	Maximum Discharge (cfs) 1993
Johnson Boy's Slough	1,441- 6,040	5/16-7/ 7	6,040	20,500
Confluence Park	2,708- 5,054	5/ 9-6/ 4	5,000	15,400
Adobe Creek	7,540-13,700	5/12-6/13	13,700	44,000
30-29 Road	5,511- 8,619	5/16-6/ 2	8,930	25,900
Griffith'	3,974- 9,022	5/12-6/14	9,022	25,900
Clifton San. No. 1	5,698- 7,068	5/13-5/31	8,930	25,900
Pike's	No Data	---	8,930	25,900
EXXON	4,424-11,000	5/17-6/ 3	11,000	22,200
Battlement Mesa	6,419-11,000	5/17-6/ 8	11,000	22,200

The linear regression correlation coefficients (r^2) were high (range of 0.84 to 0.98) for stage vs. discharge relationships at five of the eight sites. However, it was unfortunate that high runoff flows did not occur in 1994 to accurately predict the stage vs. discharge relationship. Additional empirical data are necessary to more accurately verify the predicted stage vs. discharge relationship for the upper end of the May and June hydrograph. This information is even more important for estimating the magnitude, frequency,

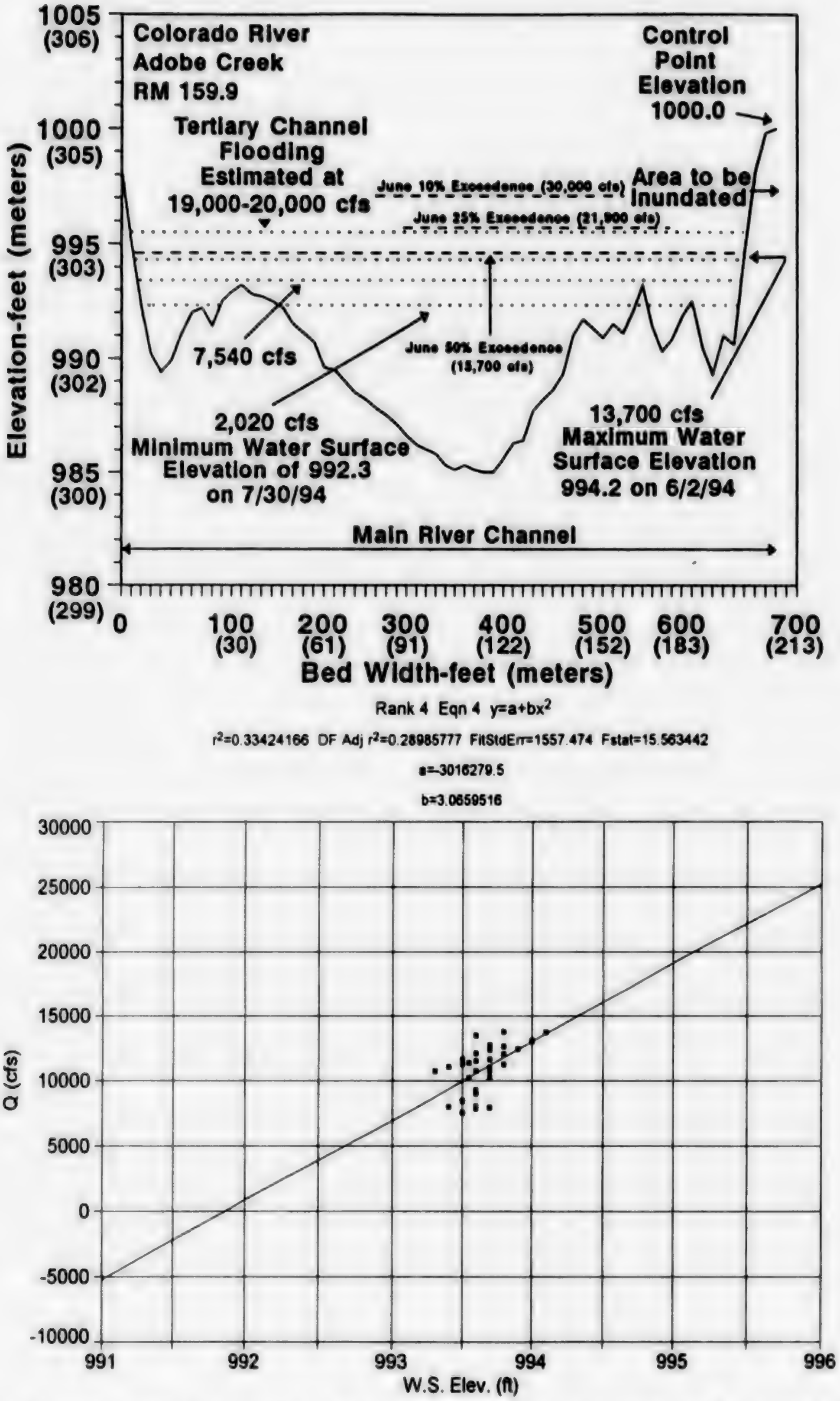

Figure 15. River profile (top) and stage vs. discharge relationship (bottom) for Adobe Creek bottomland habitat site adjacent to the Colorado River, river mile 159.9. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

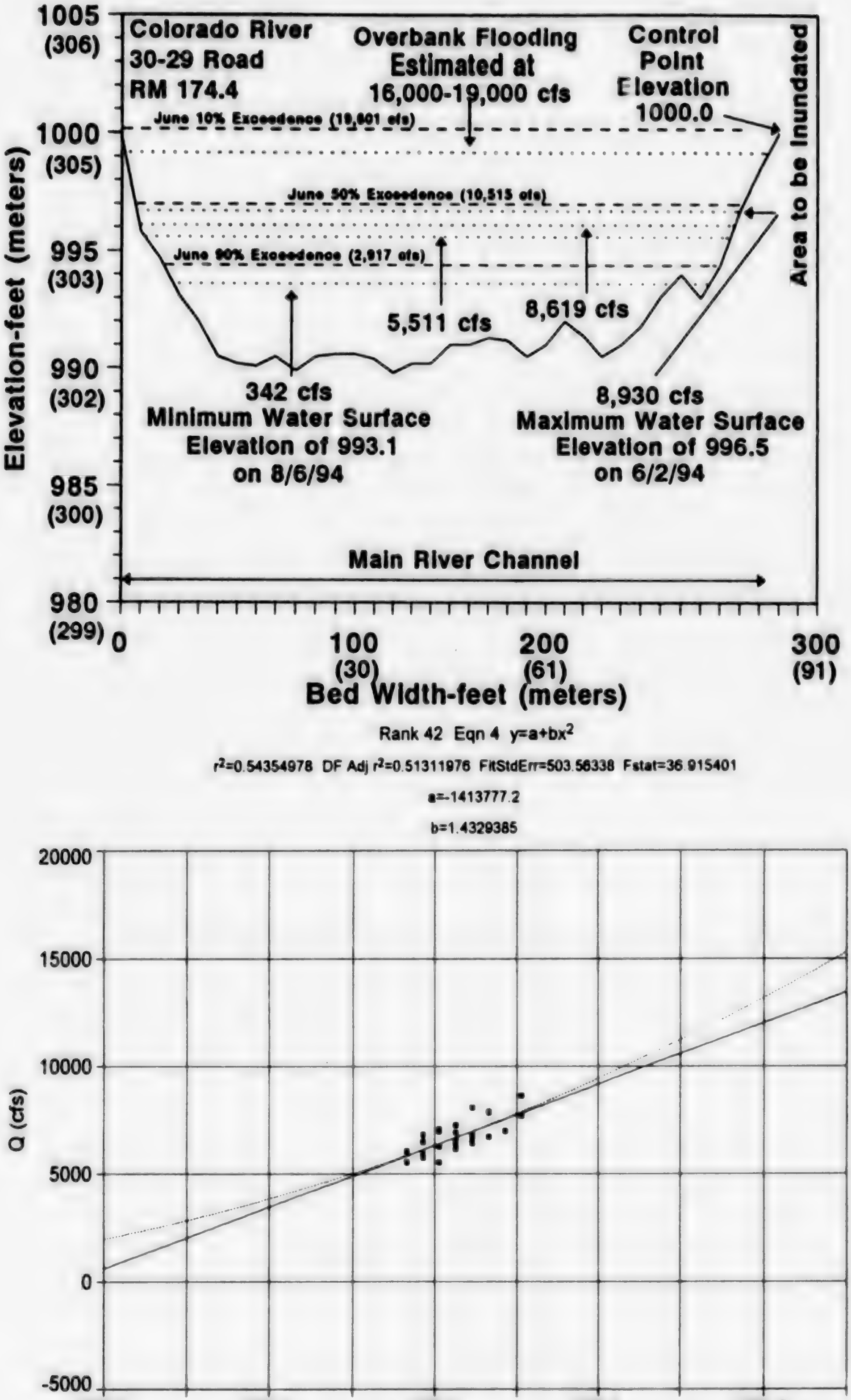

Figure 16. River profile (top) and stage vs. discharge relationship (bottom) for 30-29 Road bottomland habitat site adjacent to the Colorado River, river mile 174.4. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

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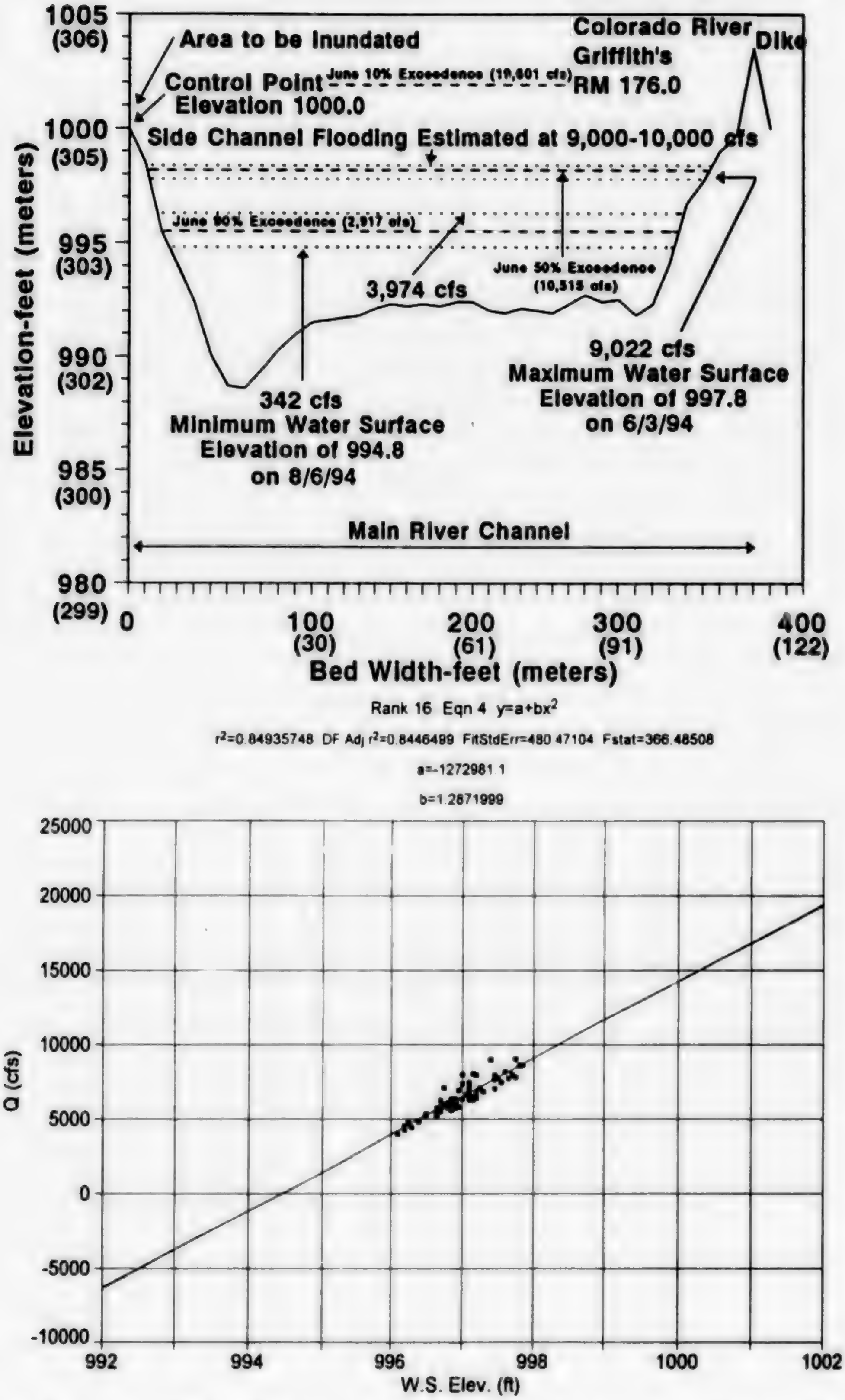

Figure 17. River profile (top) and stage vs. discharge relationship (bottom) for Griffith's bottomland habitat site adjacent to the Colorado River, river mile 176.0. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

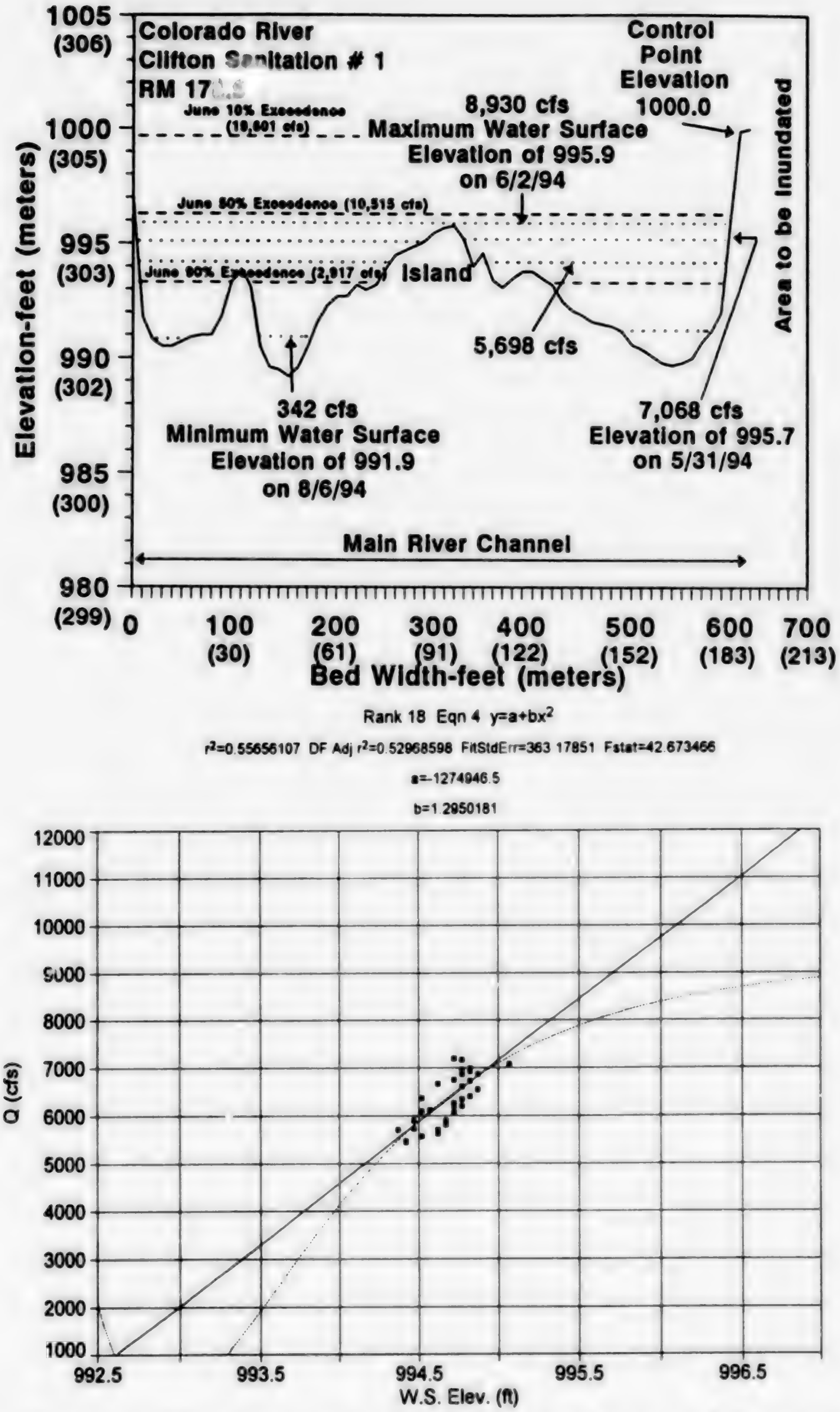

Figure 18. River profile (top) and stage vs. discharge relationship (bottom) for Clifton Sanitation No. 1 bottomland habitat site adjacent to the Colorado River, river mile 178.5. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

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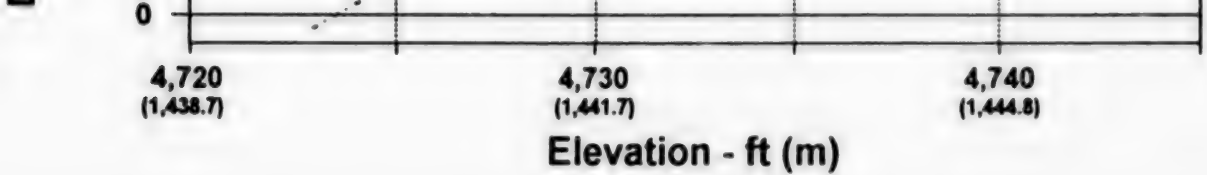

Figure 8. River profile and stage versus discharge relationship for the Meril Snow Ranch bottomland habitat site adjacent to the Green River, Utah, 1994.

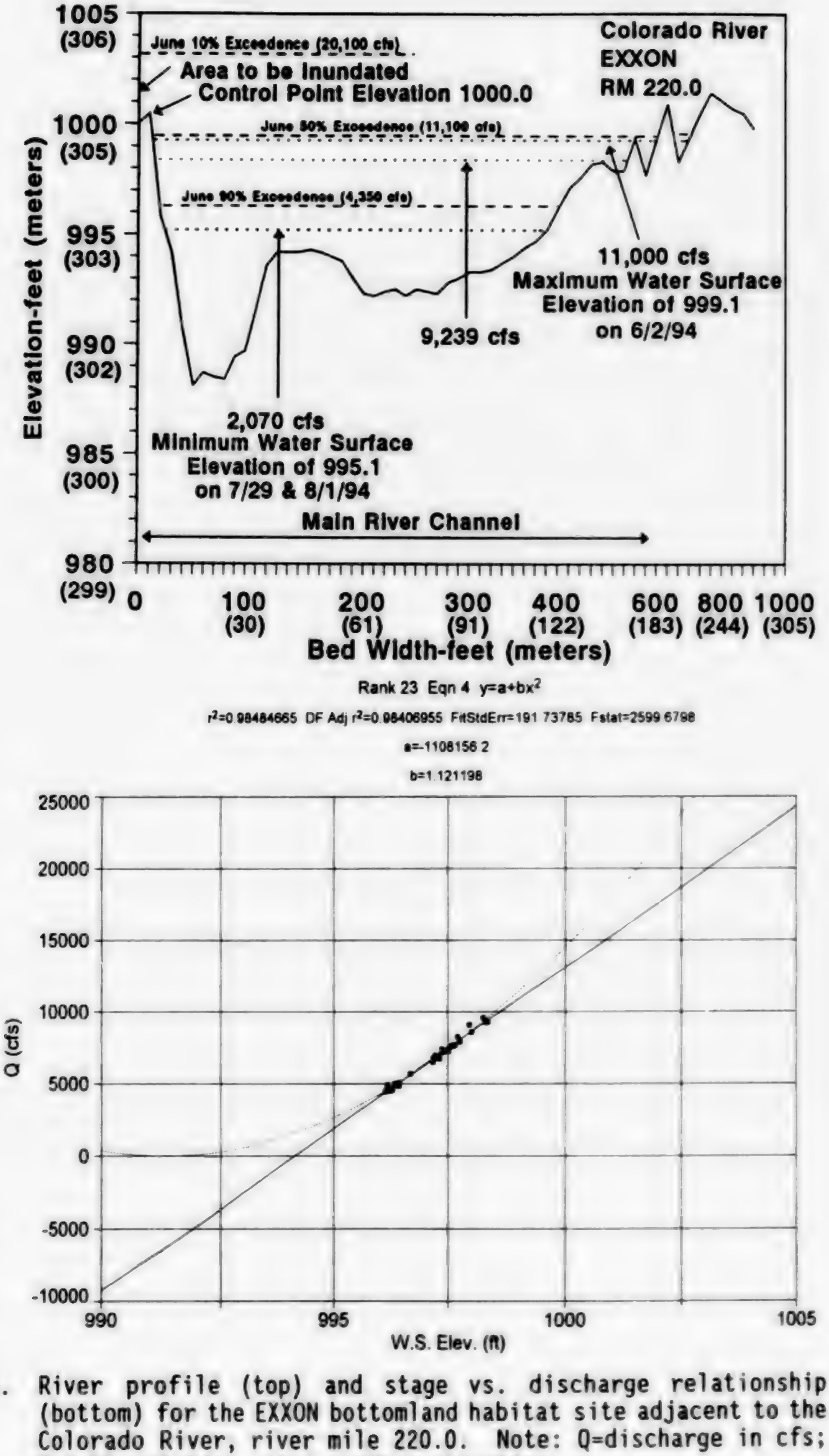

Figure 19. River profile (top) and stage vs. discharge relationship (bottom) for the EXXON bottomland habitat site adjacent to the Colorado River, river mile 220.0. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

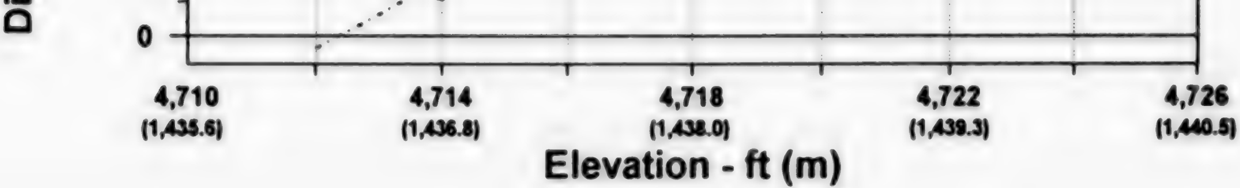

Figure 9. River profile and stage versus discharge relationship for the Little Stewart Lake bottomland habitat site adjacent to the Green River, Utah, 1994.

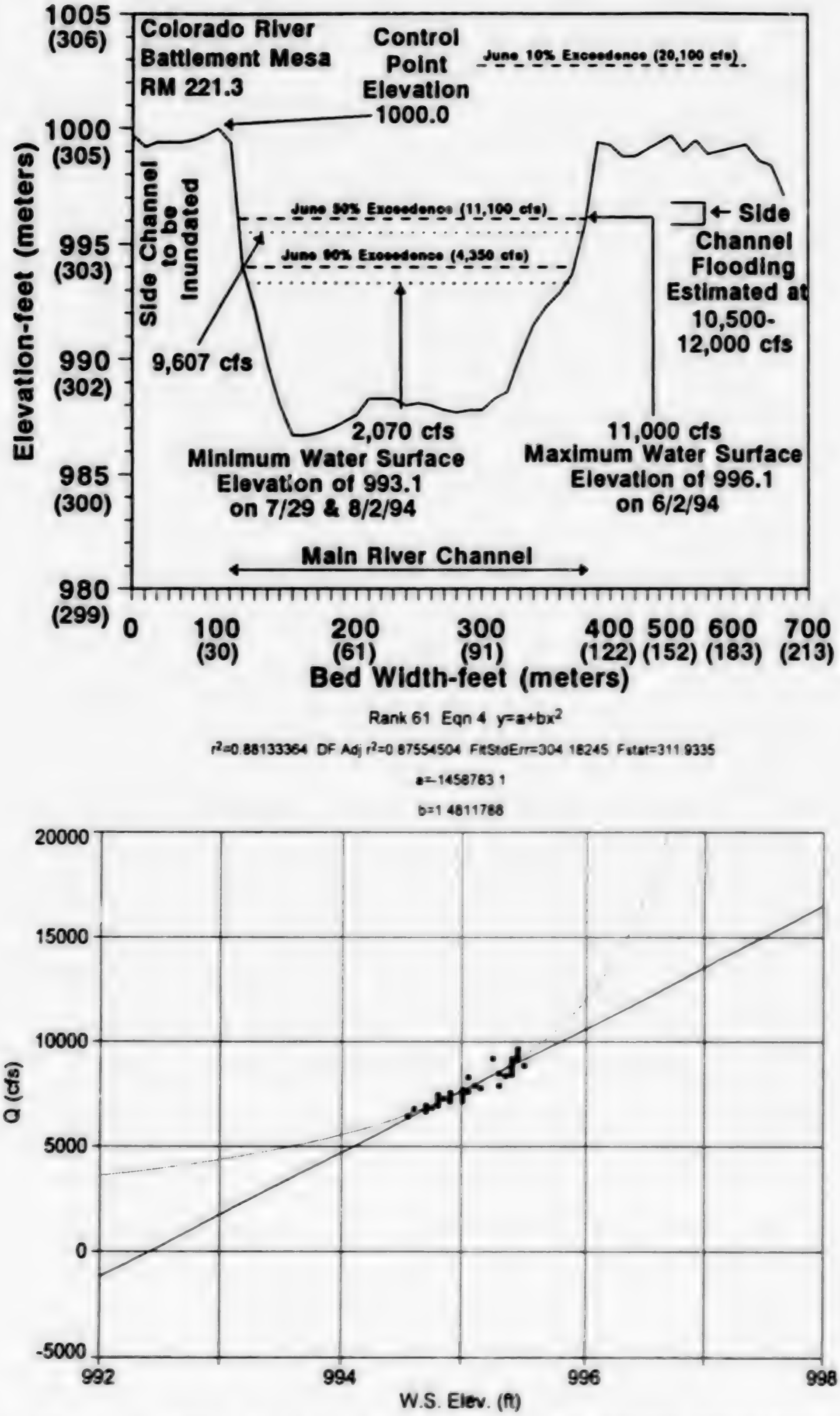

Figure 20. River profile (top) and stage vs. discharge relationship (bottom) for the Battlement Mesa bottomland habitat site adjacent to the Colorado River, river mile 221.3. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

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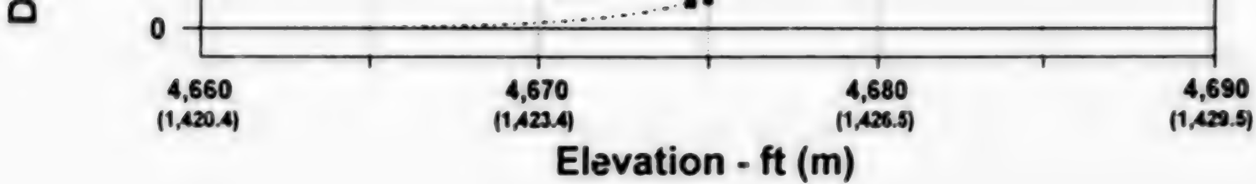

Figure 10. River profile and stage versus discharge relationship for the Baeser Bend bottomland habitat site adjacent to the Green River, Utah, 1994.

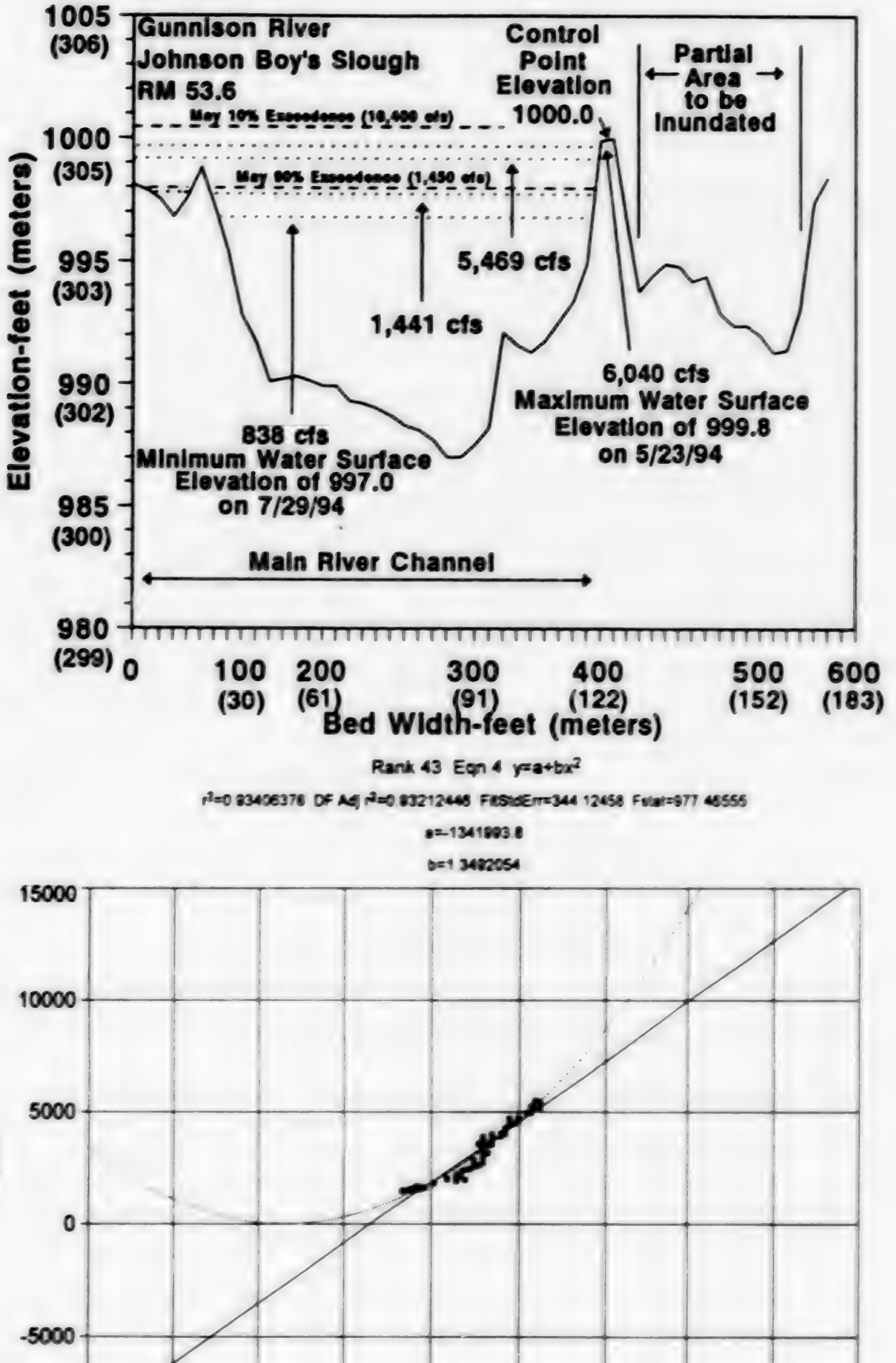

Figure 21. River profile (top) and stage vs. discharge relationship (bottom) for Johnson Boy's Slough bottomland habitat site adjacent to the Gunnison River, river mile 53.6. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

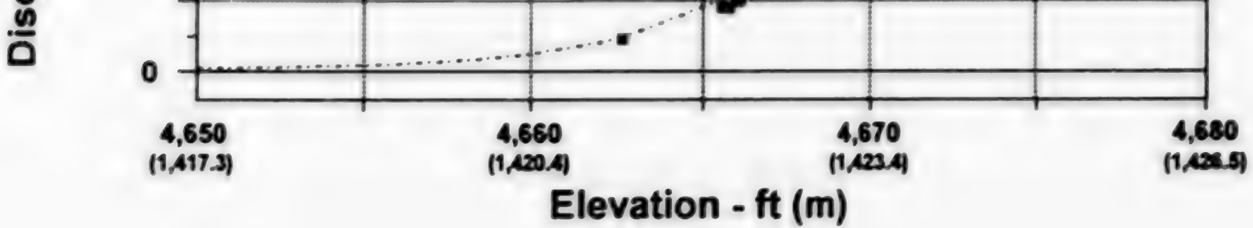

Figure 11. River profile and stage versus discharge relationship for the Johnson Bottom pond 2 bottomland habitat site adjacent to the Green River, Utah, 1994.

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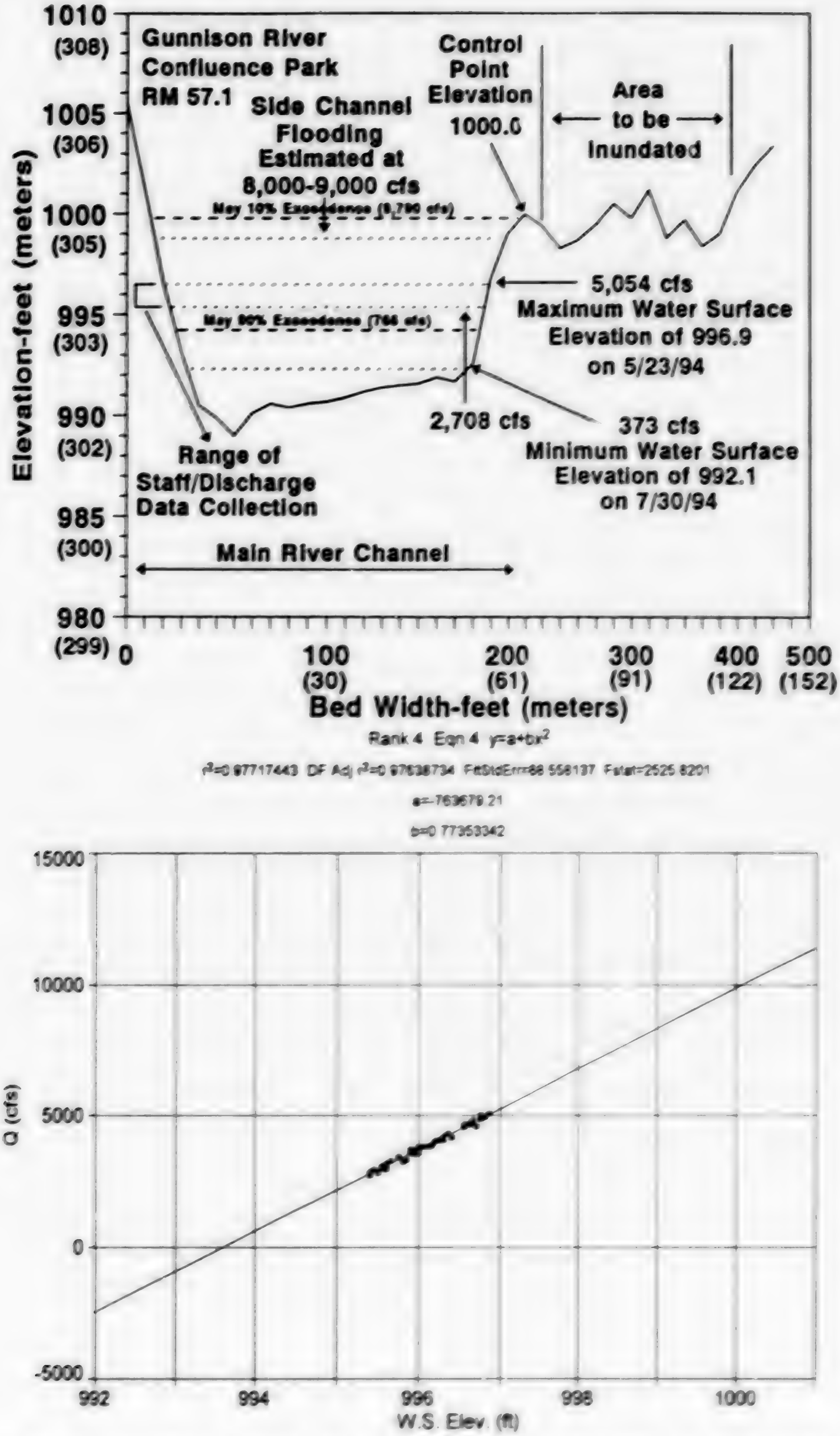

Figure 22. River profile (top) and stage vs. discharge relationship (bottom) for Confluence Park bottomland habitat site adjacent to the Gunnison River, river mile 57.1. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

and duration of flows necessary to flood a bottomland site. Therefore, the flows that were estimated to flood each of these bottomland sites should be considered provisional in this report.

Channel Cross Sections. Channel cross sections at each of the nine bottomland sites were conducted in August and September (Figures 15-23). The widest wetted cross section was at Adobe Creek (670 feet [204 m]); the narrowest cross section was at Confluence Park on the Gunnison River (200 feet [61 m]). Using the stage-discharge and flow-frequency data (Appendix I; Figures I.2-I.6), we estimated the flow necessary to flood the particular bottomland (tertiary side channel, depression, terrace, oxbow, etc.) for six of the nine sites (Table 8; Figures 15-22). For example, at Adobe Creek (Colorado River rm 159.9 [rkm 257]) we estimated the tertiary side channel would flood at about 19,000-20,000 cfs, flows that might be experienced about one year out of every three (since 1952). However, validation of the stage

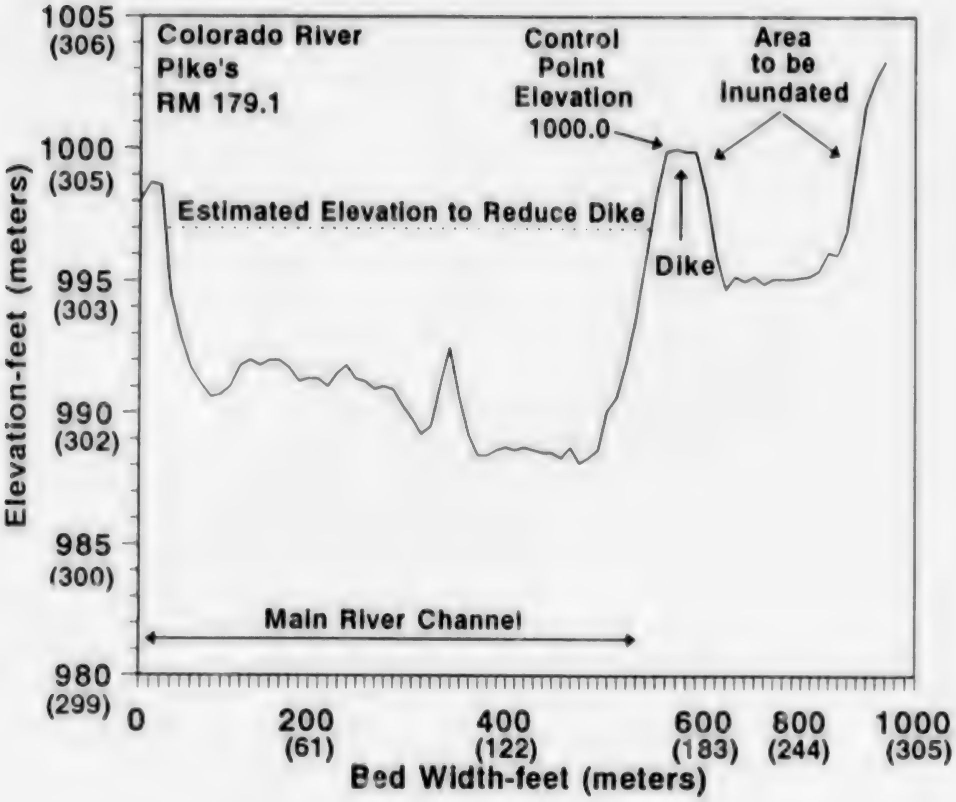

Figure 23. River profile for Pike's bottomland habitat site adjacent to the Colorado River, river mile 179.1. Note: stage vs. discharge relationship not available for this site.

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Table 8. Estimated overbank flooding and frequency of flooding at the nine bottomland habitat sites in the Colorado and Gunnison rivers. Overbank flooding was determined from staff vs. discharge relationships and river profiles conducted for each site in 1994. Flow percentile data for the post-water development period were taken from USGS stream gauging stations nearest the site.

Site River Mile	Estimated Overbank/ Side Channel Flooding (cfs)	Percent of Time[a] Flood Flows Are Available	USGS Stream Gauge/ Time Period Evaluated
Johnson Boy's Slough GU 53.7[b]	No Estimate	---	---
Confluence Park GU 57.1	8,000- 9,000	15-20%	GU @ Delta/ 1967-1993
Adobe Creek CO 159.9	19,000-20,000	20-25%	CO @ Stateline/ 1952-1993
30-29 Road CO 174.4	16,000-19,000	10%	15-mile[c]
Griffith's CO 176.0	9,000-10,000	50%	15-mile
Clifton Sanitation No. 1 CO 178.5	Reduce dike elevation to 996.0 9,600	50%	15-mile
Pike's CO 179.1	No Estimate	---	---
EXXON CO 220.0	No Estimate	---	---
Battlement Mesa CO 221.3	10,500-12,000	44-54%	CO @ Cameo/ 1952-1993

[a] For example 15-20% of the time = 1.5 to 2 years out of 10

[b] GU=Gunnison River; CO=Colorado River

[c] The USGS stream gauge for the 15-mile reach was installed in 1991 and only three years of data are available. Therefore there is an insufficient data base to conduct a direct flow exceedence analysis for this reach. Another approach was used. 15-mile reach mean daily flow exceedence for June was determined by adding the mean daily flows at the Cameo and Plateau Creek USGS stream gauges for June for the post-water development period, 1970-1993. Diversions upstream of the 15-mile reach and downstream of the Cameo and Plateau Creek gauges were subtracted. The flow value used for the diversions for June was 1,679 cfs (2,260 minus 581).

vs. discharge relationship at this site is needed because the correlation coefficient was the lowest of the eight sites (r^2=0.29). Re-establishing a staff gauge and obtaining another data set during runoff at this site and at three other sites, Pike's on the Colorado River and Johnson Boy's Slough and Confluence Park on the Gunnison River, is necessary to refine the stage vs. discharge relationship and obtain more reliable estimates of overbank flooding. This should be conducted during runoff of a water year higher than that experienced in 1994.

At Confluence Park on the Gunnison River, inundation of a side channel was estimated to occur between 8,000-9,000 cfs, which now occurs about 15-20% (one and one-half to two years out of 10) since 1977. It is uncertain what minimum flow is required to inundate this site. It might be slightly higher than the estimated 8,000-9,000 cfs flow level because color aerial photographs (1:12000) taken 2 June 1993 confirmed that the Confluence Park site was inundated on this date when the mean daily streamflow at the Delta USGS gauge was 11,100 cfs.

To inundate the 30-29 Road Site, 16,000-19,000 cfs would be required, which presently occurs about once every 10 years (since 1970). Griffith's, a floodplain terrace with side channels, appears to flood more often (about once every two years) than any of the other six sites. Flows necessary to flood the side channel at this site were estimated to be about 9,000-10,000 cfs. The Battlement Mesa site presently floods a flow-through side channel about four to fives times every 10 years (Table 8). At the Clifton Sanitation No. 1 site removing a portion of the human-made dike by reducing the present elevation by about four feet would reconnect a former side channel to the river more frequently (once every two years) during runoff. Dikes exist at Confluence Park, Johnson Boy's Slough, Adobe Creek, 29-5/8 Road, and Pike's. We did not estimate the flows necessary to flood these sites with complete or partial removal of dikes. However, the flows necessary to inundate bottomland habitats at each of these sites can be predicted using stage-discharge data (Figures 15-22). Given the present hydrologic regime, current water availability, and future compact water development in the Upper Colorado River Basin, inundating bottomland sites might be best accomplished by removing portions of- or entire human-made dikes or natural obstructions (e.g., levees) to increase flooding frequency. Those sites that flood more frequently under the existing hydrologic regime will also flood more frequently in the future, and will provide more benefits to endangered fish.

Land Ownership Status

Green River Drainage

Most (75%) of the bottomlands in the Browns Park National Wildlife Refuge area is Federal ownership (Appendix E; Tables E.1. and E.2.; Figure 24). Forty-two percent of the land between Escalante Ranch and Brennan Bottom is in private ownership. All of the Ouray National Wildlife Refuge bottomland sites are federally owned. Seventy-one percent of the bottomland sites are on tribal lands between Ouray and Pariette Draw. The majority of bottomland habitat between Desert Spring and the Green and Colorado river confluence is

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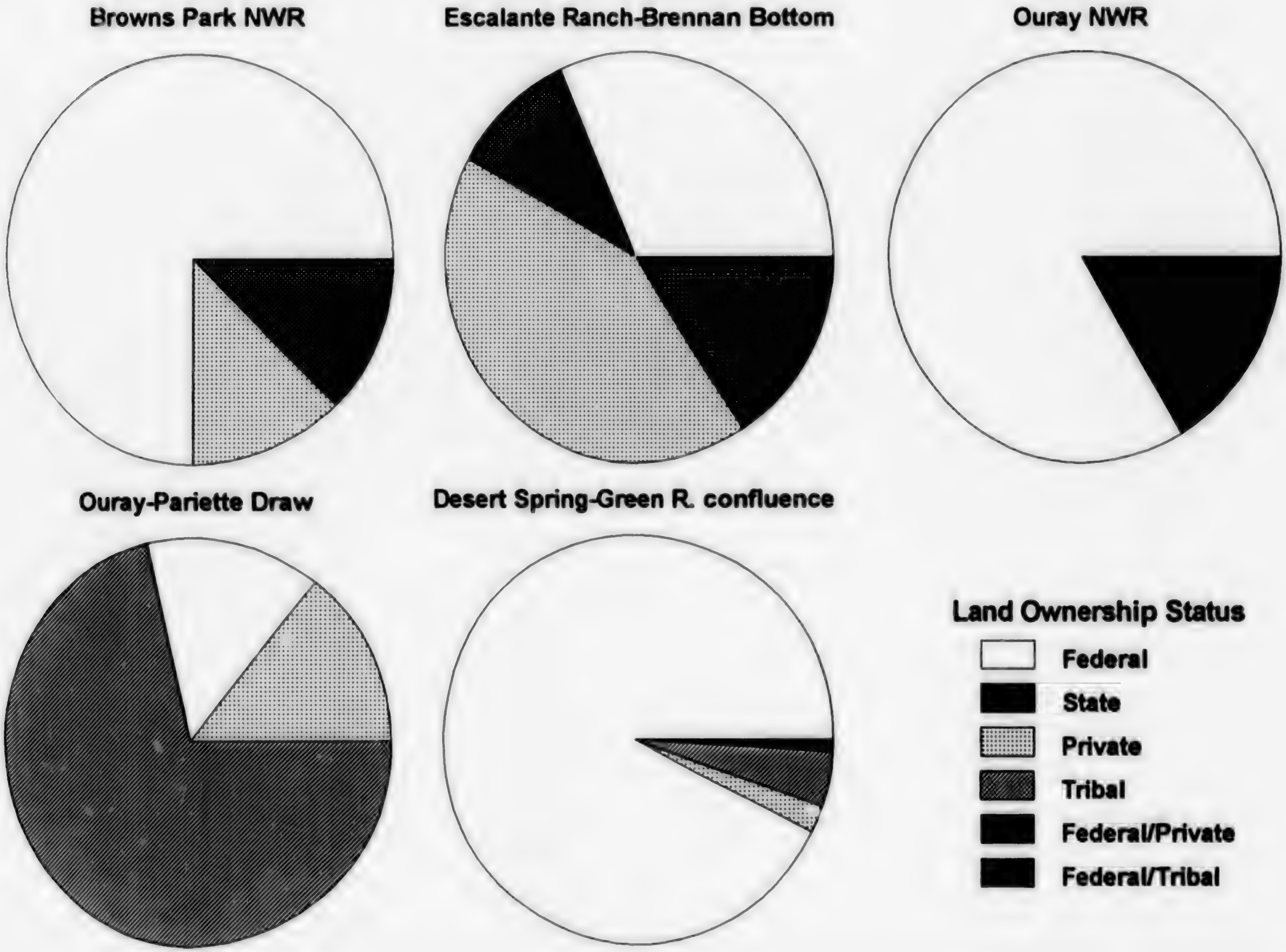

Figure 24. Land ownership status in the Browns Park National Wildlife Refuge bottomland habitat area (rm 368-393), Escalante ranch to Brennan Bottom area (rm 262-310), Ouray National Wildlife Refuge area (rm 249-265), Ouray to Pariette Draw area (rm 238-251), and Desert Spring to Green and Colorado river confluence area (rm 0-249), Green River, Colorado and Utah, 1993.

federal land. The one Yampa River site was privately owned (Appendix E; Tables E.3. and E.4.), whereas the White River oxbow site was privately owned and the confluence site on tribal reservation land (Appendix E; Tables E.5. and E.6.).

Only five of the 12 private land owners were contacted in 1993. The owners of three of these bottomland sites, Baeser Bend, Brennan Bottom, and Pariette Draw, did not have any interest in selling their land or entertaining wildlife easements. The Meril Snow Ranch owner was not interested in selling his land but was receptive to development of a wildlife easement. All of the Little Stewart Lake property is privately owned, but approximately one-half presently has a wildlife easement by FWS. The easement is administered by the Ouray National Wildlife Refuge and allows FWS access and complete management of bottomland resources. The private landowners of the non-easement portion are not interested in selling their land or developing a wildlife easement.

None of the tribal-owned bottomland sites (Duchesne and White river confluence areas, West Branch, and Tia Juana Bottom) were available for land acquisition or wildlife easement. The Woods Bottom (Old Charlie Wash) bottomland site is owned by the tribe, but is currently being leased by FWS.

Colorado River Drainage

Of the 110 bottomland sites identified and inventoried along the 241 miles of the Colorado River, 51% or about 6,355 acres (2,572 ha) are in private ownership (Appendix H; Table H.1.; Figure 25). Of the 48 bottomland sites along the 75 miles of the Gunnison River, 70% or about 2,221 acres (899 ha) are in private ownership (Appendix H; Table H.1.; Figure 26). Fifteen percent (1,826 acres [739 ha]) of the bottomland sites along the Colorado River is in public (state and federal) ownership and 22% (697 acres [282 ha]) along the Gunnison River is in public (state and federal) ownership.

The greatest amount of bottomland habitat along the Colorado River owned by the federal government (83%) is within Canyonlands National Park (Figure 26). The federal government does not own any bottomland area between Rifle and Loma (Figure 26). The federal government owns or controls only 8% of the bottomland habitat along the Gunnison River and that lies within a canyon-bound area between Roubideau Creek (rm 50 [rkm 81]) and the Colorado River confluence.

It is apparent from the vast area that is owned or controlled by private landowners, willingness from these landowners to cooperate will have an important impact if the Floodplain Habitat Restoration Program is to succeed. Innovative and creative strategies and approaches to establish agreements, easements, or acquire private property may be necessary for the program to proceed.

Johnson Boy's Slough along the Gunnison River is privately and jointly owned by Kenneth and Wendell Johnson. Initially, they have been very cooperative in allowing access. Their property (about 500 acres [202 ha]), of which a majority is upland acreage and not necessarily bottomland habitat, is

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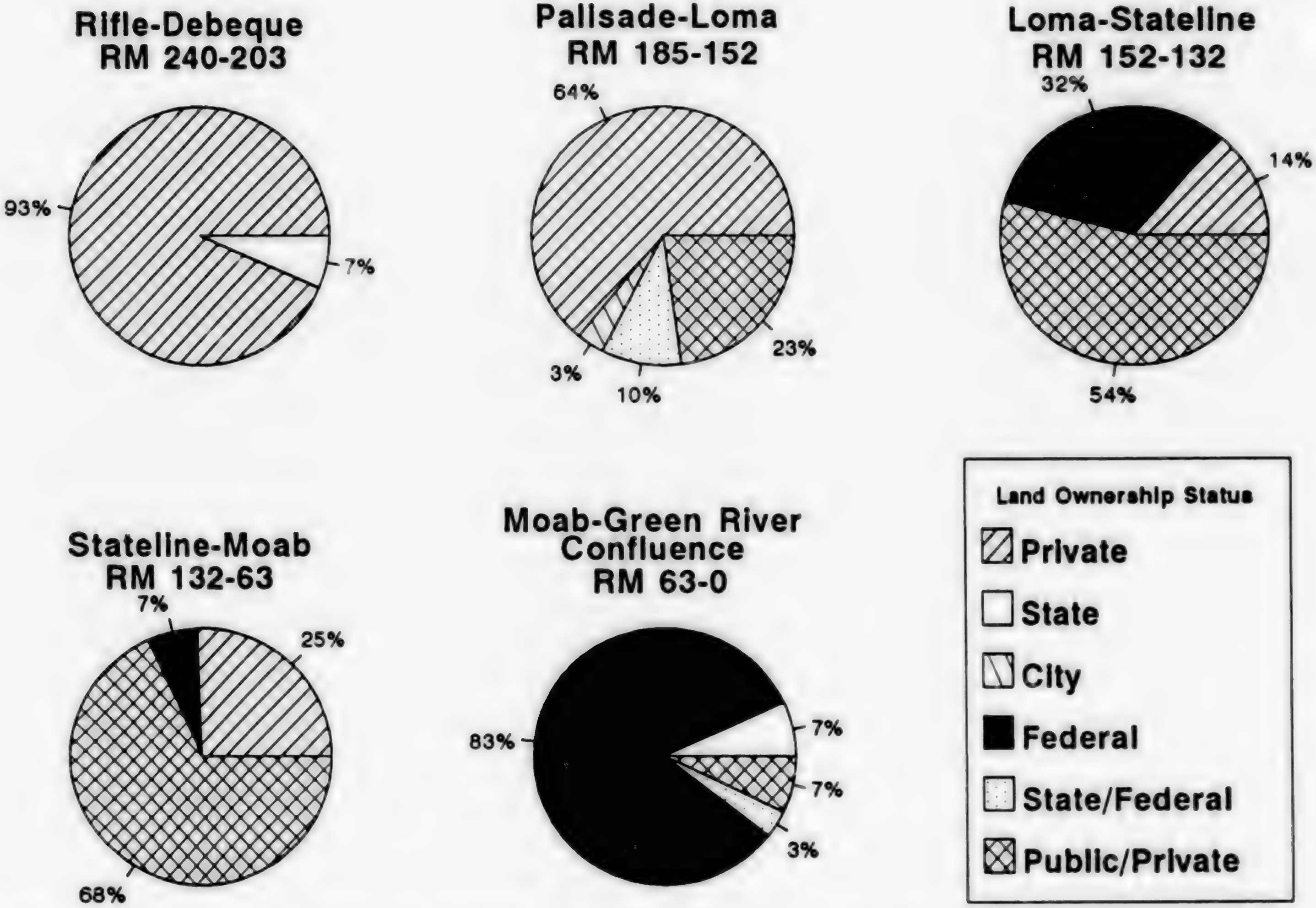

Figure 25. Land ownership status of bottomland sites inventoried in five stream reaches adjacent to the Colorado River, Colorado and Utah, extending from Rifle, Colorado (river mile 241) downstream to the Green River confluence (river mile 0). Note: land ownership by area (hectares) and percentages in Appendix G; Table G.1.

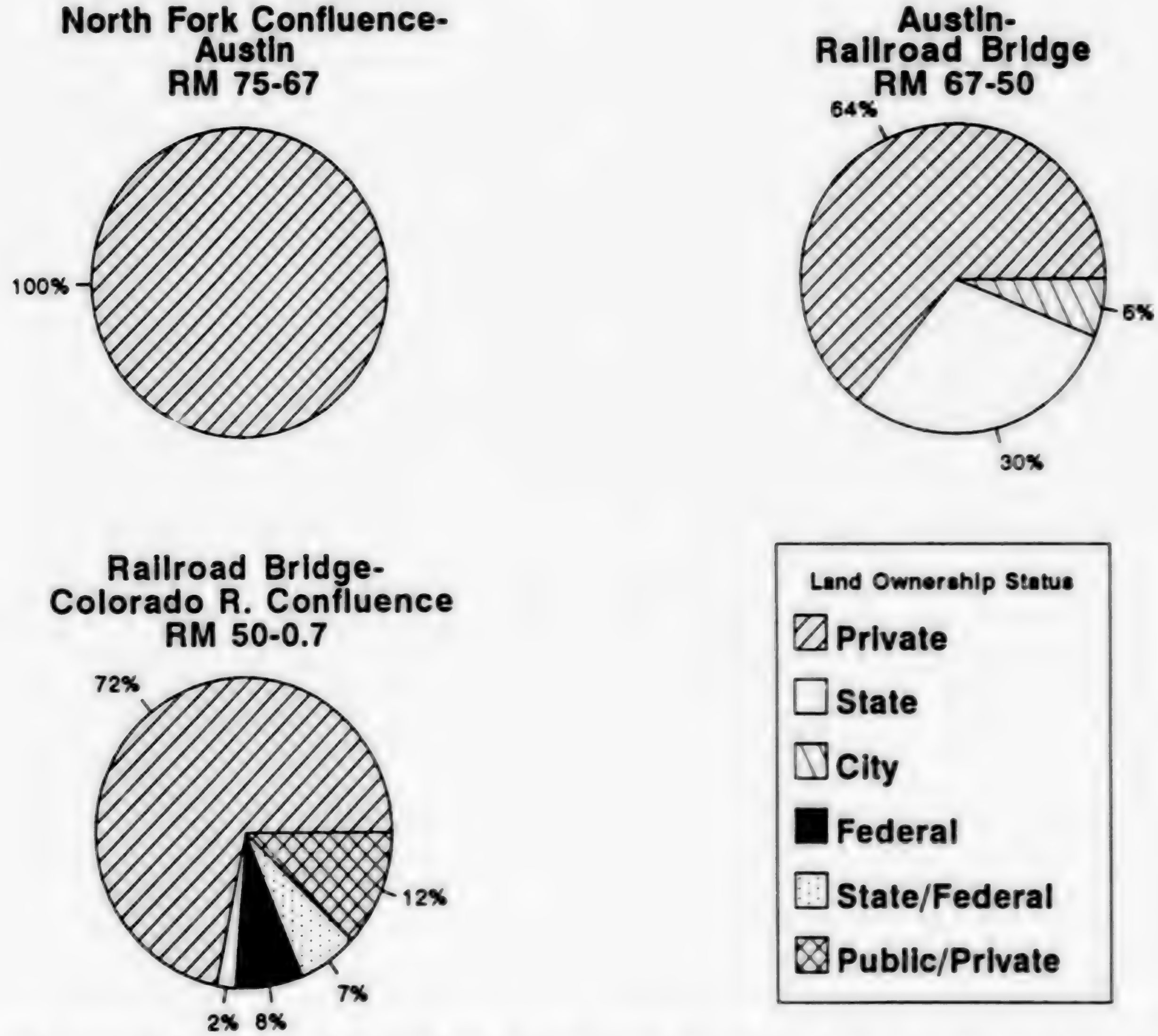

Figure 26. Land ownership status of bottomland sites inventoried in three stream reaches adjacent to the Gunnison River, Colorado extending from the North Fork River confluence (river mile 75) downstream to the Colorado River confluence (river mile 0.7). Note: land ownership by area (hectares) and percentages in Appendix G; Table G.1.

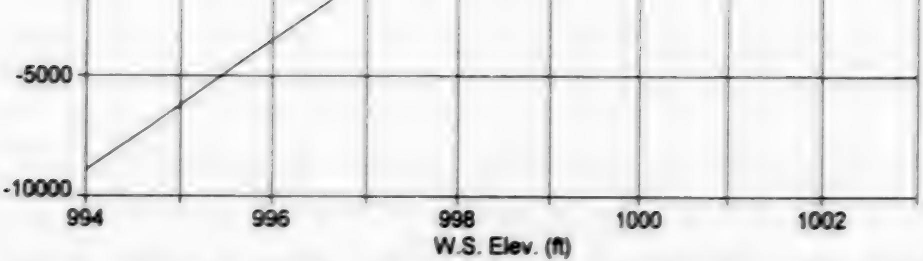

Figure 21. River profile (top) and stage vs. discharge relationship (bottom) for Johnson Boy's Slough bottomland habitat site adjacent to the Gunnison River, river mile 53.6. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

currently for sale. The former oxbow and side channel adjacent to the river have been identified as potential bottomland habitat. Confluence Park, the other site along the Gunnison River 4 miles upstream from Johnson Boy's Slough, is owned by five entities which include, 1) The City of Delta, 2) Fred Wild, 3) Ray Toole, 4) Delta Environment, Inc. (John Parker), and 5) Gerald Davidson. The first four landowners were receptive to allow further screening of their sites. The Davidson's were not interested in the program.

On the Colorado River the Adobe Creek site is owned by Mr. Oby Blanchard. He does not wish to sell his land but has allowed screening to continue and is receptive to further development at this site. The 30-29 Road Site is primarily owned by the State of Colorado, Department of Natural Resources, Division of Parks and Outdoor Recreation. They are willing participants under the Recovery Program. Acquisition is the only option available at the site owned by Mr. L. O. Griffith. This land is also being considered for purchase as mitigation under the Grand Valley Salinity Control Project (Personal communication, Pat Arbeiter, 1994). The site at rm 178.5 (rkm 287) is controlled by Clifton Sanitation No. 1. Their only option is to enter into an easement with the Recovery Program. Harold Pike is interested in selling a majority (about 18 acres [7 ha]) of his property which includes the pasture that is a depression adjacent to the river. This depression which is a former side channel is inundated during runoff but is currently protected at the downstream end by a dike that is comprised of loosely-placed cement fill.

The two bottomland habitat sites on the Colorado River between Rifle and Debeque are owned by corporations. Bill Wilde representing Battlement Mesa Partners indicated the bottomland site identified at rm 221.3 (rkm 356) will be not be developed and "left as is" for a greenbelt area. The other site immediately downstream at rm 220 (rkm 354) is owned by EXXON, Houston, Texas. EXXON's land manager has indicated that this bottomland is currently for sale.

RECOMMENDATIONS

1. Validate Overbank Flows. Flows that were estimated to flood each bottomland site are considered provisional. Staff gauges should be re-deployed at each of the seven bottomland sites in the Green River and at Adobe Creek and Pike's on the Colorado River and Johnson Boy's Slough and Confluence Park on the Gunnison River to obtain additional empirical data to verify the stage vs. discharge relationships. This is necessary so that the magnitude, frequency, and duration of flows necessary to flood these bottomland sites can be reliably estimated. High runoff flows did not occur in 1994 and the stage vs. discharge relationship could not be accurately predicted. Runoff flows in 1995 should be higher than 1994. Snowpack estimates as of 1 May 1995 indicate that the three major stream drainages in the Green River drainage are near 100% of normal (Green River: 201%; Yampa and White rivers: 120%); in the Upper Colorado River drainage both the Colorado (132%) and Gunnison River (161%) are over 100% (Personal communication, NRCS, Denver, Colorado, and Salt Lake City, Utah).

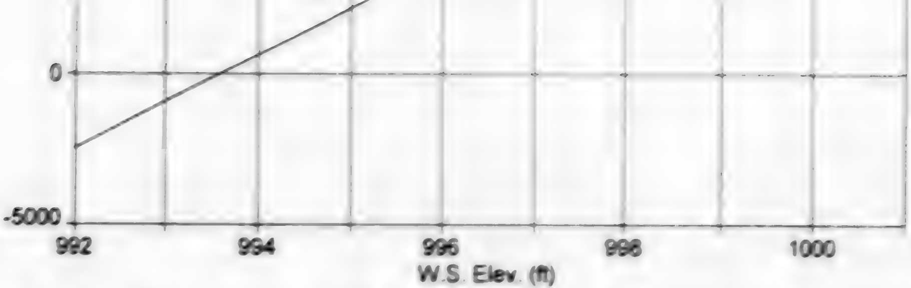

Figure 22. River profile (top) and stage vs. discharge relationship (bottom) for Confluence Park bottomland habitat site adjacent to the Gunnison River, river mile 57.1. Note: Q=discharge in cfs; W.S.El=relative water surface elevation.

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This work could be accomplished prior to and during runoff in 1995.

2. Complete Screening. Contaminant and geomorphological screening was not conducted at all of the initial 19 sites because of lack of time. Screening of bottomland sites such as Confluence Park and Johnson Boy's Slough on the Gunnison River, and Pike's (upper end of Clifton Sanitation No. 1 site), and Adobe Creek on the Colorado River should be conducted to determine if these sites are suitable and have potential for bottomland habitat restoration.

3. Additional Site Visits. Three bottomland sites along the Colorado River that were identified from photographic imagery (35-mm color slides) as depressions located downstream of Moab, Utah, deserve further on-ground investigation to determine if they have restoration potential. These sites (rm 50.9-52.5 [rkm 82-84], rm 33.2-35.6 [rkm 53-57], and rm 17.5-18.7 [rkm 28-30]), which are each less than 25 acres (10 ha), are currently heavily guarded by dense tamarisk stands and are only wetted during runoff via groundwater infiltration. These sites might provide off-channel habitats important for larval razorback sucker drifting downstream if an expected or planned upstream spawning area is identified. Since most of these sites have well established natural levees that have formed due to both reduced high flow frequencies and proliferation of tamarisk, some physical manipulation (e.g, reducing the height of the levee by excavation) of these sites would probably be required to allow fish and water access to these sites. Unfortunately, these sites are in canyon-bound areas and do pose logistical problems because they are remote and difficult to access.

4. Obtain Color Aerial Photographs. Obtain a complete set of current color aerial photographs of the entire Upper Colorado River Basin. This would include the Green River from the Colorado River confluence upstream to Browns Park, the Yampa River from the Green River confluence upstream to Cross Mountain Canyon, and the White River from the Green River confluence upstream to Taylor Draw Dam. For the Upper Colorado River, the Green River confluence upstream to Rifle and the Gunnison River from the Colorado River confluence upstream to the North Fork confluence. Photos should be at a scale between 1:6000 and 1:12000 and taken to coincide with runoff during May and June. Color photos should be taken during water years when high runoff flows are anticipated to identify those bottomland sites that may have potential for habitat restoration.

5. Re-rank Bottomland Sites. Four criteria were initially chosen that could be used with available photographic imagery and the best biological information to date to prioritize bottomland sites and to select a few (15-20) bottomland sites so that staff gauges could be installed prior to the 1994 runoff to obtain preliminary hydrology information at each site. These selection criteria could be revised, substituted, or supplemented as sites are

further screened and additional information comes forth. However, if alternative or additional criteria are developed, all bottomland sites listed in this inventory would have to be re-scored and re-ranked to generate a new prioritization list.

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APPENDIX A

The Floodplain Habitat Restoration Program, Commonly Asked Questions, and Right-of-Entry Permit Form

RECOVERY PROGRAM FOR
THE ENDANGERED FISHES
OF THE UPPER COLORADO

John Hamill,
Program Director

Ralph Morgenweck,
Implementation
Committee Chairman

U.S. Fish and Wildlife Service • P.O. Box 25486 • Denver Federal Center • Denver, Colorado 80225 • (303) 236-2985

The Flood Plain Habitat Restoration Program

The Flood Plain Habitat Restoration Program is a component of the Recovery Program for Endangered Fish of the Upper Colorado River Basin. The purpose of the Recovery Program is to recover endangered fishes while allowing water development to continue (see "Swimming Upstream" brochure). The Flood Plain Habitat Restoration Program seeks to restore riverside habitats to benefit endangered fishes of the Green, Colorado, and Gunnison rivers within Utah and Colorado. Biologists believe that young razorback suckers, and possibly bonytail chubs, rely on annual flooding to survive and grow. Habitat for these native fish is disappearing, however, because dams and levees have reduced flooding. As a result, species of native fishes that rely on flooding have declined, and some are close to extinction.

As an owner of riverfront property, you can help to prevent these fishes from becoming extinct. With your permission, our scientists would like to collect data on your property to determine its potential for providing habitat for endangered fishes. If your land is suitable for restoring fish habitat, we would like to work cooperatively with you to manage a portion of your property for the endangered fishes. This may require some initial excavation and construction, followed by some spring and summer flooding. Although the program is entirely voluntary, money is available for these cooperative projects. If you choose not to participate, then we will continue to search elsewhere for habitats that can be managed for endangered fishes.

If you desire additional information, please contact.

Patrick C. Nelson
Flood Plain Habitat Restoration Program Coordinator
U.S. Fish and Wildlife Service
P.O. Box 25486, Denver Federal Center
Denver, Colorado 80225
Phone (303) 236-2985 Extension 226

U.S. Fish and Wildlife Service • U.S. Bureau of Reclamation • Western Area Power Administration • Colorado • Utah • Wyoming
Environmental Defense Fund • National Audubon Society • Colorado Wildlife Federation • Wyoming Wildlife Federation
Colorado Water Congress • Utah Water Users Association • Wyoming Water Development Association
Colorado River Energy Distributors Association

Commonly-Asked Questions

Why do you want to collect data on my property?

Scientists from the Flood Plain Habitat Restoration Program are evaluating areas along the river which may have potential to assist in recovery of endangered fishes. Your property has been identified as one that may provide habitat for the endangered fishes.

If I give permission for scientists to collect data, how will I be affected, and how will my property be affected?

The scientists will take every precaution to avoid disturbing you, your family, and your property. We will leave it up to you to decide when scientists are allowed to collect data on your property, which access routes they can take, and whether or not they should call you before they visit your property. The scientists will take some photos and measurements, install (and later remove) a temporary gauge, and collect water, sediment, fish, and vegetation samples. There will be no noticeable evidence of this work.

How many scientists will be involved, and for how long?

There will be several scientists involved, as many as five. Some of the scientists may be accompanied by one or more assistants. Each scientist will require from one to four days to collect the necessary data. Scientists will call you before they visit your property, if you choose.

What if the scientists leave a gate open and my livestock get out, or if their truck gets stuck and they dig up my property trying to get out, or if they damage my property in some other way? Will I be paid for damages?

If your property is damaged by the government or its employees, you will be fairly compensated for the damages.

What if one of the scientists is injured while working on my property? Will I be held liable?

No. Government employees that are injured during the performance of their duties are covered by workman's compensation. You will not be held liable.

If I cooperate, what is in it for me?

If the scientists determine that your land has potential for use as endangered species' habitat, then you will be invited to participate in a cooperative agreement. A real estate specialist will visit with you to develop an agreement that is acceptable to you. If you accept, you will be compensated for your participation. Also, you will have the satisfaction of knowing that you are contributing towards recovery of endangered species.

How much compensation will I receive?

The amount of compensation you receive will depend on the size and value of your property and the type of agreement developed. A real estate specialist will be available to explain some of the options to you.

Can I refuse to participate?

Yes. If a property owner chooses not to participate, then we will look elsewhere for riverside habitats to manage for endangered species. You are under no obligation to participate.

We wish to extend our thanks to you for your consideration and participation in this very important work. If you have additional questions, you may write or call:

Patrick C. Nelson
Flood Plain Habitat Restoration Coordinator
U.S. Fish and Wildlife Service
P.O. Box 25486, Denver Federal Center
Denver, Colorado 80225
Phone (303) 236-2985 Extension 226

FLOOD PLAIN HABITAT RESTORATION PROGRAM

Right-of-Entry Permit

____________________ of ______________ COUNTY, STATE OF UTAH, does hereby grant the Bureau of Reclamation and its authorized agents or assigns permission to enter upon the following described property:

____

____

____

____

For the purpose of conducting investigations necessary to determine the suitability of the property for the Flood Plain Habitat Restoration Program. These investigations may include, but are not limited to, the following activities: surveying, collecting data or samples of soil, water, vegetation, sediment, and fish, and the installation of temporary gauges.

This agreement shall be in effect upon execution thereof, and shall remain in effect until ____________________.

The Bureau of Reclamation agrees to:

1. Pay for all damages to the land, crops, livestock, and personal property situated thereon caused through exercise of the rights granted herein based upon an appraisal made by the Bureau of Reclamation, or by mutual agreement between the parties hereto.

2. Keep all gates closed and not interfere with any livestock or irrigation practices.

3. Restore the land to as nearly its original condition as practicable, upon completion of the described work.

It is understood and agreed between the parties that the owner(s) will not be held responsible for any personal injury to employees of the United States, its agents, assigns, and contractors, nor for any damage to their personal property.

____________________ Landowner	__________ Date	ACCEPTED: United States Bureau of Reclamation
____________________ Landowner	__________ Date	BY: ____________________ __________ Date

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APPENDIX B

Existing and needed inventory maps and photos

Table B.1. Existing and needed inventory maps, aerial photographs, infrared photographs, and videos of bottomland habitat in the Green River Basin, Colorado and Utah, 1993.

DRAINAGE	EXISTING INVENTORY	INVENTORY NEEDS
Green R.	Colored infrared aerial photographs, shot at 1 in. = 6,000 ft. from Flaming Gorge Dam to the Green/Colorado River confluence in the fall of 1974 by the U.S. Army Corps of Engineers, SLC, Ut. Colored aerial videography, shot at various altitudes from Flaming Gorge dam to Jensen and them at Ouray during the May and June 1992 by Argonne National Laboratories, Bowling Brook. Ill. Various maps from the early 1900's to present by the U.S. Bureau of Reclamation, SLC, Ut.	Colored infrared aerial photographs, shot at 1 in. = 10,000 ft. from Flaming Gorge Dam to the Green/Colorado River confluence in at high (May-June) and low (July/August) discharge. The existing aerial photographs do not provide the needed information because they were shot at 1:6,000 only include the main river channel and not the adjacent bottomland areas.
Yampa R.	Colored infrared aerial photographs, shot at 1 in. = 6,000 ft. of the entire river in late 1970's or early 1980's by the U.S. Army Corps of Engineers, Grand Junction, Co. Various maps from the early 1900's to present by the U.S. Bureau of Reclamation, Denver, Co.	Colored infrared aerial photographs, shot at 1 in. = 10,000 ft. from Flaming Gorge Dam to the Green/Colorado River confluence in at high (May-June) and low (July/August) discharge. The existing aerial photographs do not provide the needed information because they were shot at 1:6,000 only include the main river channel and not the adjacent bottomland areas.
White R.	Colored infrared aerial photographs, shot at 1 in. = 6,000 ft. of the entire river in late 1970's or early 1980's by the U.S. Army Corps of Engineers, Grand Junction, Co. Various maps from the early 1900's to present by the U.S. Bureau of Reclamation, Denver, Co.	Colored infrared aerial photographs, shot at 1 in. = 10,000 ft. from Flaming Gorge Dam to the Green/Colorado River confluence in at high (May-June) and low (July/August) discharge. The existing aerial photographs do not provide the needed information because they were shot at 1:6,000 only include the main river channel and not the adjacent bottomland areas.

Gunnison Boy's Slough and Confluence Park on the Gunnison River to obtain additional empirical data to verify the stage vs. discharge relationships. This is necessary so that the magnitude, frequency, and duration of flows necessary to flood these bottomland sites can be reliably estimated. High runoff flows did not occur in 1994 and the stage vs. discharge relationship could not be accurately predicted. Runoff flows in 1995 should be higher than 1994. Snowpack estimates as of 1 May 1995 indicate that the three major stream drainages in the Green River drainage are near 100% of normal (Green River: 201%; Yampa and White rivers: 120%); in the Upper Colorado River drainage both the Colorado (132%) and Gunnison River (161%) are over 100% (Personal communication, NRCS, Denver, Colorado, and Salt Lake City, Utah).

APPENDIX C
Complete and partial inventory plan for the Green and Colorado rivers, 1993

to Rifle and the Gunnison River from the Colorado River confluence upstream to the North Fork confluence. Photos should be at a scale between 1:6000 and 1:12000 and taken to coincide with runoff during May and June. Color photos should be taken during water years when high runoff flows are anticipated to identify those bottomland sites that may have potential for habitat restoration.

5. Re-rank Bottomland Sites. Four criteria were initially chosen that could be used with available photographic imagery and the best biological information to date to prioritize bottomland sites and to select a few (15-20) bottomland sites so that staff gauges could be installed prior to the 1994 runoff to obtain preliminary hydrology information at each site. These selection criteria could be revised, substituted, or supplemented as sites are

Table C.1.Plan for complete and partial infrared photograph inventories for the Green River, Colorado and Utah, 1993.

PLAN A: Complete Inventory	**PLAN B: Partial Inventory**
Green River: Take colored infrared aerial photographs of the Green River from Flaming Gorge Dam to the Green/Colorado River confluence (410 rm [659.8 rkm]). Shoot at 1 in. (2.5 cm) = 10,000 ft. (3,048 m) during high (May-June) and low (July-August) discharge. The cost to shoot this area would be about $28,700 ($70/mile [$43.5/km]). Yampa River: Take colored infrared aerial photographs of the Yampa River from Cross Mountain Canyon to the Yampa/Green River confluence (47 rm [75.6 rkm]). Shoot at 1 in. (2.5 cm) = 10,000 ft. (3,048 m) during high (May-June) and low (July- August) discharge. The cost to shoot this area would be about $3,290 ($70/mile [$43.5/km]). White River: Take colored infrared aerial photographs of the White River from Taylor Draw Dam to the White/Green River confluence (104 rm [167.4 rkm]). Shoot at 1 in. (2.5 cm) = 10,000 ft. (3,048 m) during high (May-June) and low (July-August) discharge. The cost to shoot this area would be about $7,280 ($70/mile [$43.5/km]).	Green River: Take colored infrared aerial photographs of the Green River at specific bottomland reaches. Shoot at 1 in. (2.5 cm) = 10,000 ft. (3,048 m) during high (May-June) and low (July-August) discharge. The cost is $70/mile ($43.5/km). Brown's Park (rm 396 [rkm 637.3]) - Island Park (rm 333 [rkm 535.9]), a distance of 63 rm (101.4 rkm) and a cost of about $4,410. Split Mountain (rm 320 [rkm 515.0]) - Horseshoe Bend (rm 280 [rkm 450.6]), a distance of 40 rm (64.4 rkm) and a cost of about $2,800. Split Mountain (rm 320 [rkm 515.0]) - Sand Wash (rm 216 [rkm 347.6]), a distance of 104 rm (167.4 rkm) and a cost of about $7,280. Horseshoe Bend (rm 280 [rkm 450.6]) - Ouray Refuge (rm 258 [rkm 415.2]), a distance of 22 rm (35.4 rkm) and a cost of about $1,540. Ouray Refuge (rm 258 [rkm 415.2]) - Sand Wash (rm 216 [rkm 347.6]), a distance of 42 rm (67.6 rkm) and a cost of about $2,940. Green River (rm 120 [rkm 193.1]) - Green/Colorado River Confluence (rm 0), a distance of 120 rm (193.1 rkm) and a cost of about $8,400. Yampa River: The same as Plan A. White River: the same as Plan A.

APPENDIX D

Bottomland habitat sites, river miles, historical and actual flooded acreages

Table D.1. Bottomland habitat sites, river mile, and actual and potential inundated acres (hectares), Green River, Colorado and Utah, May and September 1993.

Site Description	River Mile	05/25/93 Actual Area		09/28/93 Actual Area		Potential Area	
		Acres	Hectares	Acres	Hectares	Acres	Hectares
GREEN RIVER							
Sears Cr.-Allen Ranch, BPNWR	388-392.5	215.8	87.3	183.2	74.1	215.8	87.3
Crouse Creek BPNWR	381.5-382.5	70.0	28.3	39.3	15.9	70.0	28.3
Butch Cassidy lake BPNWR	379.5-380.5	90.8	36.7	0.0	0.0	90.8	36.7
Hog Lake BPNWR	376.5-378.0	213.0	86.2	59.7	24.2	350.0	141.6
Warren Bottom, BPNWR	375.5-377.0	316.4	128.0	203.2	82.2	320.0	129.5
Spitzie Bottom, Browns Park NWR	375.0-376.0	101.5	41.1	116.5	47.1	172.0	69.6
J S Hoy Bottom, Browns Park NWR	372.0-374.0	323.4	130.9	137.2	55.5	323.4	130.9
Grimes Bottom BPNWR	367.5-369.5	40.0	16.2	34.2	13.8	50.0	20.2
Escalante Ranch	302.5-309.5	148.5	60.1	51.9	21.0	750.1	303.6
Meril Snow Ranch	302.0-303.0	81.9	33.1	1.3	0.5	136.4	55.2
Gravel Ponds at Jensen	301.0-302.0	10.2	4.1	9.9	4.0	10.2	4.1
Stewart Lake	299.0-300.0	569.0	230.3	160.0	64.7	663.7	268.6
Ashley Creek confluence area	297.0-298.5	92.4	37.4	0.0	0.0	161.6	65.4
Little Stewart Lake	295.5-297.5	131.5	53.2	143.3	58.0	263.7	106.7
Spring Hollow	295.0-296.0	19.0	7.7	9.4	3.8	200.6	81.2
Walker Hollow	294.0-295.0	22.2	9.0	13.1	5.3	62.0	25.1
Alhandra Ferry Site	292.0-294.0	18.0	7.3	1.9	0.8	205.2	83.0
Gravel Pits	292.0-293.0	4.7	1.9	1.2	0.5	4.7	1.9
Bonanza Bridge Area	288.5-289.0	12.3	5.0	0.0	0.0	52.5	21.2
Collier Draw	285.5-286.5	18.7	7.6	0.0	0.0	44.0	17.8
Horseshoe Bend Area	277.0-284.0	85.0	34.4	14.1	5.7	239.0	96.7
The Stirrup	274.0-277.0	8.3	3.4	0.0	0.0	10.8	4.4
Hamacker Bottom/Baeser Bend	271.0-274.0	315.9	127.8	4.0	1.6	549.3	222.3
Downstream of Baeser Bend	269.0-272.0	42.9	17.4	0.0	0.0	68.7	27.8
Upstream of Brennan Bottom	267.0-269.0	36.9	14.9	32.4	13.1	36.9	14.9
Upstream of Brennan Bottom	266.0-267.0	8.8	3.6	0.0	0.0	32.0	12.9
Brennan Bottom	262.0-266.0	99.9	40.4	0.0	0.0	374.6	151.6
Johnson Bottom, Ouray NWR	263.0-265.0	257.8	104.3	207.6	84.0	257.8	104.3
Leota Pond Complex, Ouray NWR	257.0-262.0	865.1	350.1	99.6	40.3	1,351.1	546.8
Wyasket Lake, Ouray NWR	253.0-257.0	533.1	215.7	778.6	315.1	888.9	359.7
Sheppard Bottom, Ouray NWR	254.0-256.0	245.6	99.4	0.0	0.0	720.0	291.4
Main Old Charlie (Woods) Bottom, Ouray NWR	249.0-252.0	198.4	80.3	13.8	5.6	302.2	122.3
Diked Old Charlie (Woods) Bottom, Ouray NWR	249.0-250.0	164.7	66.7	12.7	5.1	277.3	112.2
Ouray Ute pasture land	248.0-251.0	431.7	174.7	0.0	0.0	731.2	295.9
Duchesne River confluence area	248.0-249.0	134.3	54.3	3.0	1.2	250.4	101.3
White River confluence area	248.0-249.0	496.4	200.9	0.0	0.0	614.7	248.8
West Branch area	243.0-247.0	615.1	248.9	37.4	15.1	880.9	356.5
Tia Juana Bottom	242.0-244.0	319.3	129.2	64.6	26.1	625.1	253.0
Mouth of Willow Creek	239.0-241.0	0.0	0.0	0.0	0.0	156.3	63.3
Pariette Draw	238.0-241.0	105.8	42.8	0.0	0.0	343.1	138.8
Desert Spring/Moon Bottom	227.0-228.0	10.0	4.0	0.0	0.0	10.0	4.0
Fourmile Wash/King Bottom	226.0-227.0	0.0	0.0	0.0	0.0	11.7	4.7
Indian Pasture/Hydes Bottom	224.0-225.0	30.8	12.5	0.0	0.0	65.0	26.3
Rays and Long Bottom	220.0-222.0	25.0	10.1	0.0	0.0	45.4	18.4
Between Long and Boat Bottom	219.0-220.0	5.0	2.0	0.0	0.0	11.4	4.6
Nine Mile Creek	213.0-214.0	6.6	2.7	0.0	0.0	116.1	47.0
Mutter Hole	211.0-213.0	0.0	0.0	0.0	0.0	56.1	22.7
Duches Hole	209.0-211.0	0.0	0.0	0.0	0.0	90.0	36.4
Tabyago Canyon/Little Horse	206.0-208.0	0.0	0.0	0.0	0.0	22.9	9.3
Little Horse Bottom	204.0-207.0	0.0	0.0	0.0	0.0	85.2	34.5
Downstream Maverick Canyon	203.0-204.0	0.0	0.0	0.0	0.0	147.6	59.7
Gold Hole	201.0-202.0	29.1	11.8	0.0	0.0	46.7	18.9
Rock House Bottom	200.0-201.0	2.2	0.9	0.0	0.0	80.7	32.7
Little Rock Canyon	199.0-200.0	8.2	3.3	0.0	0.0	61.6	24.9
Stampede Flat	198.0-199.0	0.0	0.0	0.0	0.0	64.6	26.1
Hoodoo Forms	197.0-198.0	0.0	0.0	0.0	0.0	184.7	74.7
Between Snap-Three Canyons	170.0-171.0	0.0	0.0	0.0	0.0	20.6	8.3
Chandler Falls Canyon	165.0-167.0	0.0	0.0	0.0	0.0	33.4	13.5
Trail and Bull Canyon Rapids	164.5-165.5	0.0	0.0	0.0	0.0	23.6	9.6
Joe Hutch Canyon/Rapids	160.0-161.0	0.0	0.0	0.0	0.0	16.8	6.8
Florence Creek/Three Fords	157.0-158.0	0.0	0.0	0.0	0.0	11.0	4.5
Downstream of Three Fords	153.5-155.0	0.0	0.0	0.0	0.0	16.3	6.6
Last Chance Canyon/Rapids	152.0-153.0	0.0	0.0	0.0	0.0	51.2	20.7
Range Creek Rapids	150.5-152.0	0.0	0.0	0.0	0.0	10.7	4.3
Little Big Horn Mesa	143.0-144.0	0.0	0.0	0.0	0.0	14.0	5.7
Price River confluence	137.0-138.5	0.0	0.0	0.0	0.0	23.7	9.6
Downstream of Price River	136.5-137.5	0.0	0.0	0.0	0.0	14.1	5.7
Short Canyon/Rapids	131.5-132.5	0.0	0.0	0.0	0.0	4.3	1.7
Willow Bend-Tusher Rapid	128.5-129.5	0.0	0.0	0.0	0.0	152.2	61.6
Upriver of Green River Utah	121.5-125.5	0.0	0.0	0.0	0.0	513.9	208.0
Little Grand Wash	114.5-115.5	0.0	0.0	0.0	0.0	23.0	9.3
Downstream of Grand Wash	113.0-114.0	0.0	0.0	0.0	0.0	62.2	25.2
Fivemile Wash/Little Valley	111.0-112.0	0.0	0.0	0.0	0.0	15.0	6.1
Downstream of Ninemile Wash	109.0-111.0	0.0	0.0	0.0	0.0	20.5	8.3
Anvil Bottom	101.5-102.5	0.9	0.4	0.0	0.0	9.7	3.9
Upstream of San Rafael River	98.0-99.0	0.0	0.0	0.0	0.0	26.4	10.7
Sand Rafael River confluence	96.5-97.5	1.0	0.4	0.0	0.0	44.0	17.8
White and Red Wash	95.0-96.5	3.9	1.6	0.0	0.0	16.5	6.7
Between Red Wash-Bull Bottom	94.0-95.5	0.0	0.0	0.0	0.0	38.7	15.7
Bull Bottom-Labyrinth Canyon	92.0-93.0	0.0	0.0	0.0	0.0	33.4	13.5
Labyrinth Canyon confluence	91.5-92.5	0.0	0.0	0.0	0.0	36.3	14.7
Three Canyon/Trin-Alcove Bend	88.5-91.5	0.0	0.0	0.0	0.0	65.2	26.4
Junes Bottom	87.0-88.0	0.0	0.0	0.0	0.0	35.9	14.5
Junes Bottom-Bull Hollow	85.0-86.0	0.0	0.0	0.0	0.0	36.5	14.8
Bull Hollow	84.0-85.0	1.7	0.7	0.0	0.0	23.4	9.5
Bull Hollow-Tenmile Canyon	81.0-83.0	0.0	0.0	0.0	0.0	37.8	15.3
Tenmile Canyon/Bottom	79.0-82.0	10.2	4.1	0.0	0.0	89.7	36.3
Keg Springs Canyon	75.0-78.5	0.0	0.0	0.0	0.0	48.1	19.5
Hey Joe Canyon	74.5-76.0	0.6	0.2	0.0	0.0	25.0	10.1
Hey Joe Canyon-Spring Canyon	74.0-75.0	0.0	0.0	0.0	0.0	33.6	13.6

Table D.1. Continued.

Site Description	River Mile	05/25/93 Actual Area		09/28/93 Actual Area		Potential Area	
		Acres	Hectares	Acres	Hectares	Acres	Hectares
GREEN RIVER							
Spring Canyon Point	69.5-74.0	0.0	0.0	0.0	0.0	89.3	36.1
Bowknot Bend	62.0-70.0	13.6	5.5	0.0	0.0	261.1	105.7
Twomile Canyon-Deadman Point	60.0-62.0	4.1	1.7	0.0	0.0	36.4	14.7
Deadman Point-Horseshoe Canyon	59.0-60.0	0.0	0.0	0.0	0.0	48.3	19.5
Downstream of Horseshoe Canyon	58.0-59.0	0.0	0.0	0.0	0.0	50.2	20.3
Cottonwood Bottom	55.0-56.5	1.8	0.7	0.0	0.0	64.3	26.0
Cottonwood-Mineral Bottoms	54.0-55.0	0.0	0.0	0.0	0.0	43.6	17.6
Mineral-Tidwell Bottoms	53.0-54.0	0.0	0.0	0.0	0.0	74.3	30.1
Tidwell Bottom	51.0-52.5	0.0	0.0	0.0	0.0	162.9	65.9
Horsethief Bottom	50.0-51.5	0.0	0.0	0.0	0.0	32.1	13.0
Woodruff Bottom	49.0-50.0	0.0	0.0	0.0	0.0	81.1	32.8
Point Bottom	47.5-49.5	0.0	0.0	0.0	0.0	32.7	13.2
Saddle Horse Bottom	45.5-47.5	0.0	0.0	0.0	0.0	14.0	5.7
Horsethief Canyon	45.0-46.0	0.0	0.0	0.0	0.0	69.6	28.2
Horsethief-Upheaval Bottom	44.0-45.5	0.0	0.0	0.0	0.0	104.7	42.4
Upheaval Bottom/Canyon	43.5-44.5	1.4	0.6	0.0	0.0	78.3	31.7
Hardscrabble Bottom	42.5-43.5	0.0	0.0	0.0	0.0	30.7	12.4
Hardscrabble-Fort Bottoms	38.5-42.5	1.9	0.8	0.0	0.0	156.2	63.2
Potato Bottom	35.5-38.0	0.0	0.0	0.0	0.0	76.8	31.1
Potato-Beaver Bottoms	34.5-35.5	0.0	0.0	0.0	0.0	44.2	17.9
Beaver-Queen Ann Bottoms	33.5-34.5	5.1	2.1	0.0	0.0	49.1	19.9
Queen Ann Bottom	33.0-34.0	2.4	1.0	0.0	0.0	68.8	27.8
Queen Ann-Anderson Bottoms	32.0-33.0	0.0	0.0	0.0	0.0	15.0	6.1
Anderson Bottom	30.0-31.5	2.1	0.8	4.8	1.9	23.3	9.4
Unknown and Valentine Bottoms	29.0-32.0	0.0	0.0	0.0	0.0	112.2	45.4
Valentine Bottom	27.0-29.0	1.3	0.5	0.0	0.0	117.8	47.7
Stillwater Canyon-Sphinx	26.0-28.5	17.7	7.2	0.0	0.0	96.3	39.0
Downstream Valentine Bottom	25.5-26.5	45.5	18.4	0.0	0.0	67.6	27.4
Valentine-Tuxedo Bottoms	24.0-25.5	0.0	0.0	0.0	0.0	96.9	39.2
Tuxedo Bottom-Turks head	19.5-24.0	4.0	1.6	0.0	0.0	235.9	95.5
Deadhorse Canyon confluence	18.5-20.0	1.6	0.6	0.0	0.0	26.3	10.6
Downstream Deadhorse Canyon	17.0-19.0	2.6	1.1	0.0	0.0	57.8	23.4
Deadhorse-Horse Canyons	16.0-17.0	0.0	0.0	0.0	0.0	21.3	8.6
Horse Canyon	13.5-14.0	7.4	3.0	0.0	0.0	51.7	20.9
Downstream of Horse Canyon	12.5-13.5	0.0	0.0	0.0	0.0	32.6	13.2
Horse-Jasper Canyons	10.5-12.5	2.3	0.9	0.0	0.0	60.4	24.4
Jasper Canyon	8.0-10.5	1.8	0.7	0.0	0.0	55.8	22.6
Jasper Canyon-Short Canyon	5.0-8.0	0.6	0.2	0.0	0.0	33.5	13.6
Short Canyon-Colorado River	2.0-3.5	2.0	0.8	0.0	0.0	13.8	5.6
Upstream of Colorado River	1.0-2.0	0.6	0.2	0.0	0.0	14.8	6.0
Near Colorado River confluence	0.5-1.5	0.5	0.2	0.0	0.0	29.0	11.7
Colorado River confluence	0.0-0.5	0.0	0.0	0.0	0.0	15.6	6.3
sample statistics for all sites	n	132.0	132.0	132.0	132.0	132.0	132.0
	min	0.0	0.0	0.0	0.0	4.3	1.7
	mean	58.5	23.7	18.5	7.5	139.6	56.5
	max	865.1	350.1	778.6	315.1	1,351.1	546.8
	sum	7,719.8	3,124.1	2,437.9	986.6	18,429.7	7,458.2
sample statistics for inundated sites	n	74.0	74.0	28.0	28.0	132.0	132.0
	min	0.5	0.2	1.2	0.5	4.3	1.7
	mean	104.3	42.2	87.1	35.2	139.6	56.5
	max	865.1	350.1	778.6	315.1	1,351.1	546.8
	sum	7,719.8	3,124.1	2,437.9	986.6	18,429.7	7,458.2
YAMPA RIVER							
Upstream Snake River confluence	48.0-48.5	21.9	8.9	0.0	0.0	21.0	8.9
WHITE RIVER							
Oxbow downstream Highway 65	91.0-93.0	18.9	7.6	17.6	7.1	18.9	7.6
White/Green river confluence	0.0-2.5	496.4	200.9	0.0	0.0	614.7	248.8
	n	2.0	2.0	2.0	2.0	2.0	2.0
	min	18.9	7.6	0.0	0.0	18.9	7.6
	mean	257.7	104.3	8.8	3.6	316.8	128.2
	max	496.4	200.9	17.6	7.1	614.7	248.8
	sum	515.3	208.5	17.6	7.1	633.6	256.4

Table D.2. Bottomland habitat sites, river mile, actual (May [runoff] and September [post-runoff] 1993) inundated area (hectares), and historical inundated area (hectares), Colorado and Gunnison rivers, Colorado and Utah, May and September 1993.

		Actual Inundated Area (ha)		
Site Description	River Mile	Runoff (May 1993)	Post-Runoff (September 1993)	Historical Inundated Area (ha)
Colorado River				
Rifle West	238.0-241.1	12.2	12.1	150.7
Rifle I-70 West Interchange	236.5-238.0	5.3	5.3	126.4
CDOW/Gentry Property	234.2-235.8	10.4	10.2	66.8
"Trash-can Pond"	230.2-230.8	5.3	1.8	5.8
Mahaffey/Lemon	228.2-229.8	6.5	2.3	54.4
Mahaffey's	228.5-229.5	2.5	2.2	30.5
Hoaglund's	227.1-227.7	1.2	< 0.1	16.4
Dere/Ortiz	227.5-228.5	6.1	6.0	39.3
Parachute East	223.0-223.4	2.1	0.7	13.7
Knight's	224.5-225.4	4.4	0	28.2
Parachute Bridge	223.0-223.4	2.1	0.7	13.7
"No-name"	222.7-223.1	0.4	0.6	8.6
"No-name"	221.1-222.9	11.5	11.3	23.4
Battlement Mesa	220.7-221.7	10.2	3.9	34.4
EXXON	218.9-220.1	3.1	0	34.9
Doyle Property	218.4-219.5	0	0	8.7
"No-name"	217.2-218.0	1.4	0	22.3
Una North	216.4-217.4	6.4	6.3	40.7
Wallace Creek Island	215.9-216.5	3.4	0	13.3
Stoddard Property	209.4-210.1	8.1	8.1	23.2
Debeque I-70 Slough	209.6-211.4	6.7	3.6	40.4
Latham's	207.9-208.8	6.2	1.6	26.1
"No-name"	206.2-207.5	2.1	0	22.9
Etter's	204.7-206.6	22.8	22.8	65.1
"No-name"	202.3-204.2	6.9	3.3	86.4
"No-name"	201.9-202.4	0.2	0	6.1
Long Point Bottom	198.0-198.9	2.3	0.2	10.6
Beavertail	194.3-195.6	2.0	1.8	12.6
Island Acres	191.1-192.1	11.4	11.4	28.1
Cameo	190.0-191.0	1.2	1.2	24.6
Palisade	184.2-185.0	2.5	2.1	22.0
"No-name"	183.3-184.3	3.8	1.3	17.2
Labor Camp	182.9-183.6	8.3	2.7	19.6
"No-name"	181.6-182.6	0.6	0	43.3
"No-name"	181.7-182.2	2.8	2.2	6.9
"No-name"	180.4-181.5	4.2	1.4	21.2
Clifton Water Treatment	179.1-181.1	20.7	17.8	122.5
Clifton Pond	177.7-178.2	21.7	15.6	81.7
Corn Lake	176.6-177.7	14.5	8.3	38.6
Humphrey's	175.3-176.7	47.9	25.0	86.2
Griffith's	174.1-176.5	24.2	2.6	52.7
"Hotspot Junction" (30-29 Road)	173.9-175.1	11.3	9.4	97.9
"No-name"	173.4-173.8	1.4	0.6	10.6
"No-name"	173.0-173.6	0	0	7.8
Mill Tailing Site	172.5-173.4	1.9	< 0.1	40.6
Watson Island	171.0-172.1	9.3	4.6	20.6
"No-Name"	171.3-171.8	3.0	0.4	5.9
"No-name"	170.4-171.0	11.2	0	16.4
Connected Lakes Area	168.7-170.3	77.2	59.3	220.6

Table D.2. Continued.

Site Description	River Mile	Actual Inundated Area (ha) Runoff (May 1993)	Actual Inundated Area (ha) Post-Runoff (September 1993)	Historical Inundated Area (ha)
Colorado River				
Walter Walker South	164.4-166.0	28.7	3.0	60.3
"No-name"	166.4-169.7	30.7	20.3	117.0
Appleton Drain East	165.1-166.4	19.5	17.0	61.1
Walter Walker SWA	162.7-165.1	17.6	4.7	144.5
Panorama	163.1-163.6	3.1	2.8	20.6
"No-name"	161.0-162.7	2.5	0.9	20.6
DuPont Island	161.0-162.0	16.8	3.6	73.9
DuPont's	159.1-161.9	37.5	25.2	86.6
Paul Smith's	158.0-159.1	13.8	2.4	53.4
Fruita Sewage Ponds	156.6-158.0	16.6	16.5	40.9
Fruita 340 Bridge	157.5-158.3	0.8	0.4	17.0
Snook's Bottom	155.9-157.1	1.4	0.6	38.0
Horsethief SWA	151.9-154.7	4.9	1.5	180.9
Spann's	151.4-152.4	5.2	4.7	34.0
"No-name"	150.8-151.5	0	0	27.5
Crow Bottom	143.9-146.5	0	0	96.0
"No-name"	145.5-146.6	0	0	39.7
Vulture Bottom	139.7-142.1	0	0	61.5
"No-name" Island	137.2-138.0	0	0	23.2
Black Rocks	136.7-137.1	0.6	0	17.8
Knowles Canyon	133.6-135.0	1.0	0	52.0
Jouflas Bottom	129.8-133.9	0	0	99.6
Wildass Canyon Ranch	127.3-131.3	14.6	1.9	189.0
"No-name"	125.8-126.8	0.8	0	54.0
Elizondo Ranches	126.5-127.8	4.0	1.7	87.1
Westwater Wash	124.8-126.0	16.8	0.2	84.0
Cisco Landing Area	107.6-111.6	4.0	0	267.0
Fish Ford Area	103.0-105.9	10.6	0	100.5
McGraw/Hotel Bottom	98.1-101.0	24.7	?	123.7
White Ranch	77.5-78.4	0	0	26.1
Courthouse Wash	63.8	1.6	0	2.8
Moab Slough	61.5-64.0	212.0	81.0	354.0
Kane Spring	58.2	1.6	0	2.8
Billboard (Lake Bottom)	50.9-52.5	9.9	0	36.0
Jackson Bottom	47.4-49.0	13.8	0	34.0
"No-name"	44.0-44.7	11.4	0	23.0
"No-name"	42.8-43.7	4.8	0	22.0
"No-name"	41.1-42.1	10.7	0	22.3
"No-name"	40.2-41.3	0.4	0	21.0
"No-name"	39.5-40.6	1.2	0	17.4
"No-name" Canyon Mouth	38.8	0.4	0	1.2
"No-name"	38.6-39.2	0.6	0	10.5
Goose Neck	33.2-35.6	10.1	0	57.5
Shafer Canyon Mouth	34.8	1.2	0	5.8
"No-name" Canyon Mouth	32.1	0.4	0	1.6
"No-name" Canyon Mouth	31.6	0.2	0	1.6
"No-name"	30.8-31.9	1.9	0	27.9
Little Bridge Canyon	30.0	0.8	0	1.8
Lockhart Canyon	26.5	0.6	0	5.8
"No-name"	25.3-26.5	7.7	0	31.0

Table D.2. Continued.

Site Description	River Mile	Actual Inundated Area (ha) Runoff (May 1993)	Actual Inundated Area (ha) Post-Runoff (September 1993)	Historical Inundated Area (ha)
Colorado River				
Lathrop Canyon	23.5	0.4	0	4.5
Buck Canyon	22.7	0.6	0	4.5
Gooseberry Canyon	21.7	0.4	0	2.8
Dogleg Canyon	21.2	0.4	0	3.2
Sheep Bottom	17.5-18.7	0.8	0	27.3
Indian Creek Canyon Mouth	16.5	0.6	0	4.5
Monument Creek Mouth	15.3	0.2	0	5.3
"No-name" Canyon Mouth	11.9	< 0.1	0	3.2
"No-name" Canyon Mouth	10.1	0.2	0	0.4
Salt Creek Canyon Mouth	3.4	< 0.1	0	2.9
Elephant Creek Canyon Mouth	3.0	< 0.1	0	1.7
sample statistics	n	110	109	110
	min	0	0	0.4
	max	212.0	81.0	354.0
	mean	9.1	4.2	45.0
	sum	1,000.3	459.3	4,948.4
Gunnison River				
"No-name"	74.3-74.7	0	0	24.0
Lawhead Gulch Bottom	70.1-71.6	0.4	0	13.8
Ferganchick's	69.5-70.5	0	0	16.7
"No-name"	68.3-69.4	0	0	12.1
"No-name"	67.5-68.2	0	0	3.8
Austin County Bridge	65.7-66.4	0	0	17.2
Austin Hwy 92 Bridge	65.0-65.5	4.1	0	13.5
"No-name"	63.3-65.3	0.8	0	52.2
"No-name"	63.0-64.6	0	0	17.7
Colorado Hwy 65 Bridge	62.6-63.2	9.9	0	14.4
Tongue Creek	61.5-62.5	16.2	0	35.6
Hutchin's	60.1-60.8	4.8	1.6	17.3
North Delta	57.6-59.5	14.0	0	49.3
South Delta	57.6-58.8	10.0	9.9	39.9
Confluence Park	56.7-57.7	8.4	6.7	40.1
Uncompahgre R. Confluence	56.3-57.0	8.1	9.3	34.4
Delta City Sewage Plant	55.6-56.5	14.7	3.6	38.0
"No-name"	54.6-55.5	1.9	1.5	27.9
"No-name"	54.2-55.1	9.8	2.2	28.2
"No-name"	53.1-54.1	1.3	0	21.7
Johnson Boy's Slough	53.2-54.2	9.9	4.1	63.1
Escalante SWA North	50.8-52.9	28.7	6.0	110.5
Escalante SWA South	50.2-52.4	48.6	4.5	82.6
"Blue Duck" Bottom	49.5-50.4	6.2	0	21.7
"No-name"	49.4-49.7	3.5	0	11.2
"No-name"	48.6-49.3	3.5	0	14.1
"No-name"	46.6-47.5	4.9	0	14.2
Escalante Ranches	41.7-42.8	2.5	0	15.1
"No-name"	39.9-41.0	16.4	0	33.8
Dominguez	36.4-36.9	2.8	1.3	11.0

Table D.2. Continued.

Site Description	River Mile	Actual Inundated Area (ha)		Historical Inundated Area (ha)
		Runoff (May 1993)	Post-Runoff (September 1993)	
Gunnison River				
Broughton	35.6-36.0	9.4	0	25.0
McKendricks's	34.8-36.3	3.5	0	44.9
Peeple's South (VIP Camp)	34.0-35.2	2.9	0	23.1
Peeple's Island	34.6-34.9	5.7	2.2	8.6
Sand Flat	27.3-28.7	0.4	0	14.5
Tunnel Point	26.3-26.9	2.8	0	6.6
Dads Flat	24.7-26.3	0.2	0	38.9
Deer Run	23.0-23.6	1.5	0.2	9.9
"No-name"	22.1-22.7	0	0	10.0
"No-name"	21.3-21.8	5.5	3.4	9.3
"No-name"	18.4-19.2	3.5	0	4.4
Kannah Creek	18.0-18.6	1.2	0.4	13.0
Whitewater Blding Materials	13.3-16.0	10.3	0	70.0
Duck Blind	12.7-13.8	19.6	0	32.0
Bangs Canyon	11.7-13.0	13.6	7.3	38.5
Schroeder's	4.5-6.1	10.3	0.8	26.1
Mule Farm	3.1-3.9	12.2	0	31.0
Redlands	2.2-3.0	1.3	0	4.8
sample statistics	n	48	48	48
	min	0	0	3.8
	max	48.6	9.9	110.5
	mean	7.0	1.4	27.2
	sum	335.3	65.0	1,305.7

APPENDIX E

Parameters used to categorize and rank floodplain restoration sites

Table E.1. The 10 parameters from 35-mm colored slide photo-imagery used to categorize and rank bottomlands important to endangered fishes in the Green River, Colorado and Utah (Part 1).

Basin: Upper Colorado River

Sub-basin: Green River

River: Green River

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Location					Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area Acres (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area Acre (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Sears Cr.-Allen Ranch BPNWR[a]	388.0-392.5	T11N	R24E	13	215.8	Y	215.8	Y	2	Both	Gravity[b]	215.8	Y	183.2	Y	2	Both	Gravity
Crouse Creek BPNWR	381.5-382.5	T10N	R25E	2	39.3	Y	70.0	Y	2	Both	Gravity	70.0	Y	39.3	Y	2	Both	Gravity
Butch Cassidy Lake, BPNWR	379.5-380.5	T10N	R104W	13	90.8	Y	90.8	Y	1	Up	Gravity	90.8	N	0.0	N	1	Up	Gravity
Hog Lake, BPNWR	376.5-378.0	T10N	R103W	9	350.0	Y	213.0	N	0	None	Ground Water[c]	350.0	Y	59.7	Y	0	None	Ground Water
Warren Bottom, BPNWR	375.5-377.0	T10N	R103W	16	478.4	Y	316.4	Y	1	Up	Gravity	320.0	Y	203.2	Y	1	Up	Gravity
Spitzie Bottom BPNWR	375.0-376.0	T10N	R103W	15	172.0	Y	101.5	N	0	None	Ground Water	172.0	Y	116.5	Y	0	None	Ground Water
J S Hoy Bottom BPNW	372.0-374.0	T10N	R103W	26	323.4	Y	323.4	Y	1	Up	Gravity	323.4	Y	137.2	Y	1	Up	Gravity
Grimes Bottom BPNW	367.5-369.5	T10N	R102W	6	50.0	Y	40.0	Y	1	Up	Gravity	50.0	Y	34.2	Y	1	Up	Gravity
Escalante Ranch	302.5-309.5	T5S	R23E	4	750.1	Y	148.5	N	0	None	Ground Water	750.1	Y	51.9	Y	0	None	Ground Water
Meril Snow Ranch	302.0-303.0	T5S	R23E	16	136.4	Y	81.9	N	0	None	Ground Water	136.4	Y	1.3	Y	0	None	Ground Water
Gravel Ponds at Jensen	301.0-302.0	T5S	R23E	21	10.2	Y	10.2	N	0	None	Ground Water	10.2	Y	9.9	Y	0	None	Ground Water
Stewart Lake	299.0-300.0	T5S	R23E	29	663.7	Y	569.0	N	0	None	Ground Water	663.7	Y	160.0	Y	0	None	Ground Water
Ashley Creek confluence	297.0-298.5	T5S	R23E	31	161.6	Y	92.4	N	0	None	Ground Water	161.6	N	0.0	N	0	None	Ground Water
Little Stewart Lake	295.5-297.5	T6S	R22E	1	263.7	Y	131.5	N	0	None	Ground Water	263.7	Y	143.3	Y	0	None	Ground Water
Spring Hollow	295.0-296.0	T6S	R22E	11	200.6	Y	19.0	N	0	None	Ground Water	200.6	Y	9.4	Y	0	None	Ground Water
Walker Hollow	294.0-295.0	T6S	R22E	14	62.0	Y	22.2	N	0	None	Ground Water	62.0	Y	13.1	Y	0	None	Ground Water
Alhandra Ferry Site	292.0-294.0	T6S	R22E	15	205.2	Y	18.0	N	0	None	Ground Water	205.2	Y	1.9	Y	0	None	Ground Water
Gravel Pits	292.0-293.0	T6S	R22E	16	4.7	Y	4.7	N	0	None	Ground Water	4.7	Y	1.2	Y	0	None	Ground Water
Bonanza Bridge area	288.5-289.0	T6S	R22E	7	52.5	Y	12.3	N	0	None	Ground Water	52.5	N	0.0	N	0	None	Ground Water
Collier Draw	285.5-286.5	T6S	R21E	14	44.0	Y	18.7	N	0	None	Ground Water	44.0	N	0.0	N	0	None	Ground Water
Horseshoe Bend area	277.0-284.0	T6S	R21E	23	239.0	Y	85.0	N	0	None	Ground Water	239.0	Y	14.1	Y	0	None	Ground Water
The Stirrup	274.0-277.0	T6S	R21E	22	10.8	Y	8.3	N	0	None	Ground Water	10.8	N	0.0	N	0	None	Ground Water
Hamacker Bottom/Baeser Bend	271.0-274.0	T6S	R21E	31	549.3	Y	315.9	N	0	None	Ground Water	549.3	Y	4.0	Y	0	None	Ground Water
Downstream of Baeser Bend	269.0-272.0	T7S	R21E	33	68.7	Y	42.9	N	0	None	Ground Water	68.7	N	0.0	N	0	None	Ground Water
Upstream of Brennan Bottom	267.0-269.0	T7S	R21E	17	36.9	Y	36.9	N	0	None	Ground Water	36.9	Y	32.4	Y	0	None	Ground Water
Upstream of Brennan Bottom	266.0-267.0	T7S	R21E	20	32.0	Y	8.8	N	0	None	Ground Water	32.0	N	0.0	N	0	None	Ground Water
Brennan Bottom	262.0-266.0	T7S	R21E	19	374.6	Y	99.9	N	0	None	Ground Water	374.6	N	0.0	N	0	None	Ground Water
Johnson Bottom, ONWR[d]	263.0-265.0	T7S	R21E	30	257.8	Y	257.8	Y	2	Both	Gravity	257.8	Y	207.6	Y	2	Both	Gravity
Leota Ponds, ONWR	257.0-262.0	T7S	R21E	32	1351.1	Y	865.1	Y	2	Both	Gravity	1351.1	Y	99.6	Y	2	Both	Gravity
Wyasket Lake, ONWR	253.0-257.0	T8S	R20E	13	846.0	Y	533.1	Y	1	Up	Gravity	888.9	Y	778.6	Y	1	Up	Gravity
Sheppard Bottom, ONWR	254.0-256.0	T8S	R20E	22	720.0	Y	245.6	Y	1	Up	Gravity	720.0	N	0.0	N	1	Up	Gravity
Old Charlie (Main), ONWR	249.0-252.0	T8S	R20E	27	302.2	Y	198.4	Y	2	Both	Gravity	302.2	Y	13.8	Y	2	Both	Gravity
Old Charlie (Diked), ONWR	249.0-250.0	T8S	R20E	27	277.3	Y	164.7	Y	2	Both	Gravity	277.3	Y	12.7	Y	2	Both	Gravity
Ouray Ute Pasture area	248.0-251.0	T8S	R20E	29	731.2	Y	431.7	N	0	None	Ground Water	731.2	N	0.0	N	0	None	Ground Water
Duchesne R. confluence area	248.0-249.0	T8S	R3E	5	250.4	Y	134.3	N	0	None	Ground Water[c]	250.4	Y	3.0	N	0	None	Ground Water

[a] Browns Park National Wildlife Refuge.

[b] Water enters bottomland through a water control structure and then is gravity fed through the system.

[c] Water enters bottomland either from flooding over the bank and/or seepage from ground water. The water in some agricultural areas comes from sprinkler run-off.

[d] Ouray National Wildlife Refuge.

Table E.2. The 10 parameters from 35-mm colored slide photo-imagery used to categorize and rank bottomlands important to endangered fishes in the Green River, Colorado and Utah (Part 2).

Basin: Upper Colorado River

Sub-basin: Green River

River: Green River

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	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland		Width/ Distance	Vegetation		Proximity to Endangered Fishes[a]			Bottomland	Land	Photo Imagery	
Site	Y/N	Natural/Man-Made	ft (m)	(Y/N)	Predominant Type(s)	RM	Species	Life Stage	Description	Ownership	Type	Catalog No.[b]
Sears Cr.-Allen Ranch BPNWR[c]	Y	Man-Made	W-20	Y	Emergent[d]	81.5[e]	Razorback	Larval	Flood-Plain Depression	Private	35mm	6:13-16, 42:13-17
Crouse Creek BPNWR	Y	Man-Made	W-20	Y	Emergent	71.5[e]	Razorback	Larval	Flood-Plain Depression	State	35mm	6:22, 42:26-30
Butch Cassidy Lake, BPNWR	Y	Natural	W-10	Y	Emergent	69.5[e]	Razorback	Larval	Flood-Plain Depression	Federal	35mm	6:24, 42:33-37, 43:2-4
Hog Lake, BPNWR	N	None	-	Y	Emergent	67.0[e]	Razorback	Larval	Flood-Plain Depression	Federal	35mm	6:27-28, 43:6-7
Warren Bottom, BPNWR	Y	Man-Made	W-20	Y	Emergent	66.0[e]	Razorback	Larval	Flood-Plain Depression	Federal	35mm	6:29-30, 43:8-10
Spitzie Bottom, BPNWR	Y	Natural	-	Y	Emergent	65.0[e]	Razorback	Larval	Flood-Plain Depression	Federal	35mm	6:31, 43:11-12
J S Hoy Bottom, BPNWR	Y	Man-Made	-	Y	Emergent	64.0[e]	Razorback	Larval	Flood-Plain Depression	Federal	35mm	6:34-36, 43:13-22
Grimes Bottom, BPNWR	Y	Man-Made	W-20	Y	Emergent	58.5[e]	Razorback	Larval	Flood-Plain Depression	Federal	35mm	7:1-2, 43:25-27
Escalante Ranch	Y	Man-Made	W-10	Y	Emergent	1.5	Razorback	Larval	Flood-Plain Depression	Private	35mm	9:3-10, 47:2-12
Meril Snow Ranch	Y	Natural	W-10	Y	Emergent	8.0	Razorback	Larval	Flood-Plain Depression	Private	35mm	9:11, 47:13-15
Gravel Ponds at Jensen	N	-	-	N	-	9.0	Razorback	Larval	Gravel Pond	Private	35mm	9:12-13, 47:18-19
Stewart Lake	Y	Man-Made	W-20	Y	Emergent	11.0	Razorback	Larval	Flood-Plain Depression	State	35mm	9:14-15, 47:22-31
Ashley Creek confluence	Y	Natural	W-10	Y	Emergent	12.5	Razorback	Larval	Stream Confluence	State	35mm	9:16, 47:30-31
Little Stewart Lake (McCarrel)	Y	Man-Made	W-20	Y	Emergent	13.5	Razorback	Larval	Flood-Plain Depression	Private/Federal[f]	35mm	9:17-18, 47:32-35
Spring Hollow	N	-	-	Y	Emergent	15.0	Razorback	Larval	Flood-Plain Terrace	Private	35mm	9:19, 47:36, 48:1
Walker Hollow	N	-	-	Y	Emergent	16.0	Razorback	Larval	Flood-Plain Terrace	Private	35mm	9:20, 48:2-5
Alhandra Ferry Site	N	-	-	Y	Emergent	17.0	Razorback	Larval	Flood-Plain Depression	Private	35mm	9:21-22, 48:6-8
Gravel Pits	N	-	-	N	-	18.0	Razorback	Larval	Gravel Pond	Private	35mm	9:23-24, 48:9-11
Bonanza Bridge area	N	-	-	Y	Emergent	22.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	9:26, 48:13-16
Collier Draw	N	-	-	Y	Emergent	24.5	Razorback	Larval	Flood-Plain Depression	Federal	35mm	9:29, 48:18-19
Horseshoe Bend area	N	-	-	Y	Emergent	27.0	Razorback	Larval	Flood-Plain Terrace	Federal/Private	35mm	9:30-37, 48:21-32
The Stirrup	N	-	-	Y	Emergent	34.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:4, 48:33-36
Hamacker Bottom/Baeser Bend	N	-	-	Y	Emergent	37.0	Razorback	Larval	Flood-Plain Depression	Private	35mm	10:7-8, 49:1-5
Downstream of Baeser Bend	N	-	-	Y	Emergent	39.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:10, 49:4-6
Upstream of Brennan Bottom	N	-	-	Y	Emergent	42.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:12-13, 49:6-10
Upstream of Brennan Bottom	N	-	-	Y	Emergent	44.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:15, 49:11-14
Brennan Bottom	Y	Natural	W-10	Y	Emergent	45.0	Razorback	Larval	Flood-Plain Depression	Private/Federal	35mm	10:16-17, 49:15-19
Johnson Bottom, OWNR	Y	Man-Made	W-20	Y	Emergent	46.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:18-19, 49:20-21
Leota Ponds, OWNR	Y	Man-Made	W-20	Y	Emergent	49.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:20-30, 49:22-30
Wyasket Lake, OWNR	Y	Natural	W-20	Y	Emergent	54.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:28-30, 49:31-37
Sheppard Bottom, OWNR	Y	Man-Made	W-20	Y	Emergent	55.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	10:28-32, 49:32-37
Old Charlie Wash (Main), OWNR	Y	Man-Made	W-20	Y	Emergent	59.0	Razorback	Larval	Flood-Plain Depression	Federal/Tribe	35mm	10:31-33, 50:1-3
Old Charlie Wash (Diked), OWNR	Y	Man-Made	W-20	Y	Emergent	61.0	Razorback	Larval	Flood-Plain Depression	Federal/Tribe	35mm	10:31-33, 50:4-6
Ouray Ute Pasture area	N	-	-	Y	Emergent	60.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	10:34-36, 50:7-9
Duchesne River confluence area	Y	Man-Made	W-10	Y	Emergent	62.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	10:36, 11:1-2, 50:11-12

[a] The only known spawning site is located at river mile 311 at Razorback bar.
[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6:1-3 = roll 6, pictures 1 through 3).
[c] Browns Park National Wildlife Refuge.
[d] The most common emergent vegetation consists of Cattail, Inland Salt Grass, and White Top.
[e] Located upstream of Razorback bar spawning area.
[f] A portion of the bottomland is privately and Federally owned.

Table E.1. Continued.

Basin: Upper Colorado River
Sub-basin: Green River
River: Green River

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Location					Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area Acres (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area Acre (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
White River confluence area	248.0-249.0	T9S	R20E	4	614.7	Y	496.4	N	0	None	Ground Water	614.7	N	0.0	N	0	None	Ground Water
West Branch area	243.0-247.0	T9S	R3E	7	880.9	Y	615.1	N	0	None	Ground Water	880.9	Y	37.4	N	0	None	Ground Water
Tia Juana Bottom	242.0-244.0	T9S	R2E	3	625.1	Y	319.3	N	0	None	Ground Water	625.1	Y	64.6	N	0	None	Ground Water
Mouth of Willow Creek	239.0-241.0	T9S	R19E	14	156.3	N	0.0	N	0	None	Ground Water	156.3	N	0.0	N	0	None	Ground Water
Pariette Draw area	238.0-241.0	T9S	R19E	14	343.1	Y	105.8	N	0	None	Ground Water	343.1	N	0.0	N	0	None	Ground Water
Desert Spring/Moon Bottom	227.0-228.0	T10S	R19E	7	10.0	Y	10.0	N	0	None	Ground Water	10.0	N	0.0	N	0	None	Ground Water
Fourmile Wash/King Bottom	226.0-227.0	T10S	R19E	19	11.7	N	0.0	N	0	None	Ground Water	11.7	N	0.0	N	0	None	Ground Water
Indian Pasture/Hydes Bottom	224.0-225.0	T10S	R18E	26	65.0	Y	30.8	N	0	None	Ground Water	65.0	N	0.0	N	0	None	Ground Water
Rays and Long Bottom	220.0-222.0	T10S	R18E	27	45.4	Y	25.0	N	0	None	Ground Water	45.4	N	0.0	N	0	None	Ground Water
Between Long and Boat Bottom	219.0-220.0	T11S	R18E	12	11.4	Y	5.0	N	0	None	Ground Water	11.4	N	0.0	N	0	None	Ground Water
Nine Mile Creek	213.0-214.0	T11S	R18E	27	116.1	Y	6.6	N	0	None	Ground Water	116.1	N	0.0	N	0	None	Ground Water
Hutter Hole	211.0-213.0	T11S	R18E	35	56.1	N	0.0	N	0	None	Ground Water	56.1	N	0.0	N	0	None	Ground Water
Duches Hole	209.0-211.0	T12S	R18E	3	90.0	N	0.0	N	0	None	Ground Water	90.0	N	0.0	N	0	None	Ground Water
Tabyago Canyon/Little Horse	206.0-208.0	T12S	R18E	9	22.9	N	0.0	N	0	None	Ground Water	22.9	N	0.0	N	0	None	Ground Water
Little Horse Bottom	204.0-207.0	T12S	R18E	10	85.2	Y	0.0	N	0	None	Ground Water	85.2	N	0.0	N	0	None	Ground Water
Downstream Maverick Canyon	203.0-204.0	T12S	R18E	17	147.6	N	0.0	N	0	None	Ground Water	147.6	N	0.0	N	0	None	Ground Water
Gold Hole	201.0-202.0	T12S	R18E	30	46.7	Y	29.1	N	0	None	Ground Water	46.7	N	0.0	N	0	None	Ground Water
Rock House Bottom	200.0-201.0	T12S	R18E	30	80.7	Y	2.2	N	0	None	Ground Water	80.7	N	0.0	N	0	None	Ground Water
Little Rock Canyon	199.0-200.0	T12S	R18E	31	61.6	Y	8.2	N	0	None	Ground Water	61.6	N	0.0	N	0	None	Ground Water
Stampede Flat	198.0-199.0	T12S	R18E	31	64.6	N	0.0	N	0	None	Ground Water	64.6	N	0.0	N	0	None	Ground Water
Hoodoo Forms	197.0-198.0	T13S	R18E	6	184.7	N	0.0	N	0	None	Ground Water	184.7	N	0.0	N	0	None	Ground Water
Between Snap-Three Canyons	170.0-171.0	T15S	R17E	21	20.6	N	0.0	N	0	None	Ground Water	20.6	N	0.0	N	0	None	Ground Water
Chandler Falls Canyon	165.5-167.0	T16S	R17E	31	33.4	N	0.0	N	0	None	Ground Water	33.4	N	0.0	N	0	None	Ground Water
Trail and Bull Canyon Rapids	164.5-165.5	T16S	R17E	9	23.6	N	0.0	N	0	None	Ground Water	23.6	N	0.0	N	0	None	Ground Water
Joe Hutch Canyon/Rapids	160.0-161.0	T16S	R17E	33	16.8	N	0.0	N	0	None	Ground Water	16.8	N	0.0	N	0	None	Ground Water
Florence Cr.-Three Fords	157.0-158.0	T17S	R17E	9	11.0	N	0.0	N	0	None	Ground Water	11.0	N	0.0	N	0	None	Ground Water
Downstream of Three Fords	153.5-155.0	T17S	R17E	20	16.3	N	0.0	N	0	None	Ground Water	16.3	N	0.0	N	0	None	Ground Water
Last Chance Canyon/Rapids	152.0-153.0	T17S	R17E	29	51.2	N	0.0	N	0	None	Ground Water	51.2	N	0.0	N	0	None	Ground Water
Range Creek Rapids	150.5-152.0	T17S	R17E	32	10.7	N	0.0	N	0	None	Ground Water	10.7	N	0.0	N	0	None	Ground Water
Little Big Horn Mesa	143.0-144.0	T18S	R17E	29	14.0	N	0.0	N	0	None	Ground Water	14.0	N	0.0	N	0	None	Ground Water
Price River confluence	137.0-138.5	T19S	R16E	10	23.7	N	0.0	N	0	None	Ground Water	23.7	N	0.0	N	0	None	Ground Water
Downstream of Price River	136.5-137.5	T19S	R16E	15	14.1	N	0.0	N	0	None	Ground Water	14.1	N	0.0	N	0	None	Ground Water
Short Canyon/Rapids	131.5-132.5	T20S	R16E	3	4.3	N	0.0	N	0	None	Ground Water	4.3	N	0.0	N	0	None	Ground Water
Willow Bend-Tusher Rapid	128.5-129.5	T20S	R16E	19	152.2	N	0.0	N	0	None	Ground Water	152.2	N	0.0	N	0	None	Ground Water
Upriver of Green River Utah	121.5-125.5	T21S	R16E	10	513.9	N	0.0	N	0	None	Ground Water	513.9	N	0.0	N	0	None	Ground Water
Little Grand Wash	114.5-115.5	T22S	R16E	3	23.0	N	0.0	N	0	None	Ground Water	23.0	N	0.0	N	0	None	Ground Water
Downstream of Grand Wash	113.0-114.0	T22S	R16E	3	62.2	N	0.0	N	0	None	Ground Water	62.[illegible]	N	0.0	N	0	None	Ground Water

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[a] Browne Park National Wildlife Refuge.
[b] Water enters bottomland through a water control structure and then is gravity fed through the system.
[c] Water enters bottomland either from flooding over the bank and/or seepage from ground water. The water in some agricultural areas comes from sprinkler run-off.
[d] Ouray National Wildlife Refuge.

Table E.2. Continued.

Basin: Upper Colorado River

Sub-basin: Green River

River: Green River

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Site	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Y/N	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Natural/Man-Made	Width/ Distance ft (m)	Vegetation (Y/N)	Vegetation Predominant Type(s)	Proximity to Endangered Fishes[a] RM	Proximity to Endangered Fishes[a] Species	Proximity to Endangered Fishes[a] Life Stage	Bottomland Description	Land Ownership	Photo Imagery Type	Photo Imagery Catalog No.[b]
White River confluence area	Y	Man-Made	W-10	Y	Emergent	62.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	10:36, 50:13-14
West Branch area	N	-	-	Y	Emergent	64.0	Razorback	Larval	Flood-Plain Depression	Tribe	35mm	11:3-5, 50:15-17
Tia Juana Bottom	N	-	-	Y	Emergent	67.0	Razorback	Larval	Flood-Plain Depression	Tribe	35mm	11:6-9, 50:18-22
Mouth of Willow Creek	N	-	-	Y	Emergent	70.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	11:12, 50:23-28
Pariette Draw area	N	-	-	Y	Emergent	70.0	Razorback	Larval	Flood-Plain Terrace	Private	35mm	11:14, 50:29-30
Desert Spring/Moon Bottom	N	-	-	Y	Emergent	83.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	11:25-26, 51:1-2
Fourmile Wash/King Bottom	N	-	-	N	-	84.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	11:27, 51:3-4
Indian Pasture/Hydes Bottom	N	-	-	N	-	86.0	Razorback	Larval	Flood-Plain Depression	Federal	35mm	11:28, 51:5-10
Rays and Long Bottom	N	-	-	N	-	89.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	11:32-33, 51:12-20
Between Long and Boat Bottom	N	-	-	N	-	91.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	11:34, 51:21-25
Nine Mile Creek	N	-	-	N	-	97.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	12:4, 51:33-34
Mutter Hole	N	-	-	N	-	98.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	12:6, 51:35-38
Duches Hole	N	-	-	N	-	100.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	12:7, 52:1
Tabyago Canyon/Little Horse	N	-	-	N	-	103.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	12:9, 52:2-7
Little Horse Bottom	N	-	-	N	-	104.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	12:10, 52:8-9
Downstream of Maverick Canyon	N	-	-	N	-	107.0	Razorback	Larval	Flood-Plain Terrace	Federal/Tribe	35mm	12:11-12, 52:10
Gold Hole	N	-	-	N	-	109.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	12:14, 52:11-16
Rock House Bottom	N	-	-	N	-	110.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	12:15, 52:16-17
Little Rock Canyon	N	-	-	N	-	111.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	12:16, 52:17
Stampede Flat	N	-	-	N	-	112.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	12:18, 52:18-19
Hoodoo Forms	N	-	-	N	-	113.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	12:19-20, 52:18-19
Between Snap-Three Canyons	N	-	-	N	-	140.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:1, 53:25
Chandler Falls Canyon	N	-	-	N	-	144.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:5, 53:33-35
Trail and Bull Canyon Rapids	N	-	-	N	-	145.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:6, 53: 36-38
Joe Hutch Canyon and Rapids	N	-	-	N	-	150.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:10
Florence Creek/Three Fords	N	-	-	N	-	153.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:13, 54:1-6
Downstream of Three Fords	N	-	-	N	-	156.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:16, 54:7-10
Last Chance Canyon and Rapids	N	-	-	N	-	158.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:17, 54:10
Range Creek Rapids	N	-	-	N	-	159.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:18, 54:11-13
Little Big Horn Mesa	N	-	-	N	-	167.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:25, 54:24-25
Price River confluence	N	-	-	N	-	172.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:31, 55:3-4
Downstream of Price River	N	-	-	N	-	173.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:32, 55:5
Short Canyon and Rapids	N	-	-	N	-	178.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	13:37, 55:12-14
Willow Bend-Tusher Rapid	N	-	-	N	-	181.5	Razorback	Larval	Flood-Plain Terrace	Private	35mm	14:5, 55:19-22
Upstream of Green River, Utah	N	-	-	N	-	185.5	Razorback	Larval	Flood-Plain Terrace	Private	35mm	14:10-13, 55:28-34
Little Grand Wash	N	-	-	N	-	195.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	14:20, 56:11-13
Downstream of Grand Wash	N	-	-	N	-	197.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	14:22, 56:13-14

[a] The only known spawning site is located at river mile 311 at Razorback bar.

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6:1-3 = roll 6, pictures 1 through 3).

[c] Browns Park National Wildlife Refuge.

[d] The most common emergent vegetation consists of Cattail, Inland Salt Grass, and White Top.

[e] Located upstream of Razorback bar spawning area.

[f] A portion of the bottomland is privately and Federally owned.

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Table E.1. Continued.

Basin: Upper Colorado River
Sub-basin: Green River
River: Green River

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Location					Runoff (May 1993)							Post-Runoff (September 1993)						
					Total Potential Inundated Area		Total Area Inundated	Hydrological Connection to River				Total Potential Inundated Area		Total Area Inundated	Hydrological Connection to River			
Site	RM	T	R	S	Acres (ha)	Inundated (Y/N)	Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Acre (ha)	Inundated (Y/N)	Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Fivemile Wash/Little Valley	111.0-112.0	T22S	R16E	8	15.0	N	0.0	N	0	None	Ground Water	15.0	N	0.0	N	0	None	Ground Water
Downstream of Ninemile Wash	109.0-110.0	T22S	R16E	20	20.5	N	0.0	N	0	None	Ground Water	20.5	N	0.0	N	0	None	Ground Water
Anvil Bottom	101.5-102.5	T23S	R16E	11	9.7	Y	0.9	N	0	None	Ground Water	9.7	N	0.0	N	0	None	Ground Water
Upstream of San Rafael R.	98.0-99.0	T23S	R16E	23	26.4	N	0.0	N	0	None	Ground Water[c]	26.4	N	0.0	N	0	None	Ground Water
San Rafael River confluence	96.5-97.5	T23S	R16E	36	44.0	Y	1.0	N	0	None	Ground Water	44.0	N	0.0	N	0	None	Ground Water
White and Red Wash	95.0-96.5	T23S	R17E	31	16.5	Y	3.9	N	0	None	Ground Water	16.5	N	0.0	N	0	None	Ground Water
Between Red Wash-Bull Bottom	94.0-95.5	T24S	R17E	6	38.7	N	0.0	N	0	None	Ground Water	38.7	N	0.0	N	0	None	Ground Water
Bull Bottom-Labyrinth Canyon	92.0-93.0	T24S	R16E	12	33.4	N	0.0	N	0	None	Ground Water	33.4	N	0.0	N	0	None	Ground Water
Labyrinth Canyon confluence	91.5-92.5	T24S	R16E	13	36.3	N	0.0	N	0	None	Ground Water	36.3	N	0.0	N	0	None	Ground Water
Three Canyon/Trin-Alcove Bend	88.5-91.5	T24S	R16E	23	65.2	N	0.0	N	0	None	Ground Water	65.2	N	0.0	N	0	None	Ground Water
Junes Bottom	87.0-88.0	T24S	R17E	19	35.9	N	0.0	N	0	None	Ground Water	35.9	N	0.0	N	0	None	Ground Water
Junes Bottom-Bull Hollow	85.0-86.0	T24S	R17E	31	36.5	N	0.0	N	0	None	Ground Water	36.5	N	0.0	N	0	None	Ground Water
Bull Hollow	84.0-85.0	T24S	R17E	31	23.4	Y	1.7	N	0	None	Ground Water	23.4	N	0.0	N	0	None	Ground Water
Bull Hollow-Tenmile Canyon	81.0-83.0	T25S	R17E	6	37.8	N	0.0	N	0	None	Ground Water	37.8	N	0.0	N	0	None	Ground Water
Tenmile Canyon/Bottom	79.0-82.0	T25S	R17E	8	89.7	Y	10.2	N	0	None	Ground Water	89.7	N	0.0	N	0	None	Ground Water
Keg Springs Canyon	75.0-78.5	T25S	R17E	9	48.1	N	0.0	N	0	None	Ground Water	48.1	N	0.0	N	0	None	Ground Water
Hey Joe Canyon	74.5-76.0	T25S	R17E	16	25.0	Y	0.6	N	0	None	Ground Water	25.0	N	0.0	N	0	None	Ground Water
Hey Joe Canyon-Spring Canyon	74.0-75.0	T25S	R17E	16	33.6	N	0.0	N	0	None	Ground Water	33.6	N	0.0	N	0	None	Ground Water
Spring Canyon Point	69.5-74.0	T25S	R17E	20	89.3	N	0.0	N	0	None	Ground Water	89.3	N	0.0	N	0	None	Ground Water
Bowknot Bend	62.0-70.0	T25S	R17E	28	261.1	Y	13.6	N	0	None	Ground Water	261.1	N	0.0	N	0	None	Ground Water
Twomile Canyon-Deadman Point	60.0-62.0	T25S	R17E	32	36.4	Y	4.1	N	0	None	Ground Water	36.4	N	0.0	N	0	None	Ground Water
Deadman Point-Horseshoe Can.	59.0-60.0	T26S	R17E	4	48.3	N	0.0	N	0	None	Ground Water	48.3	N	0.0	N	0	None	Ground Water
Downstream of Horseshoe Can.	58.0-59.0	T26S	R17E	3	50.2	N	0.0	N	0	None	Ground Water	50.2	N	0.0	N	0	None	Ground Water
Cottonwood Bottom	55.0-56.5	T26S	R17E	1	64.3	Y	1.8	N	0	None	Ground Water	64.3	N	0.0	N	0	None	Ground Water
Cottonwood-Mineral Bottoms	54.0-55.0	T26S	R17E	12	43.6	N	0.0	N	0	None	Ground Water	43.6	N	0.0	N	0	None	Ground Water
Mineral-Tidwell Bottoms	53.0-54.0	T26S	R17E	24	74.3	N	0.0	N	0	None	Ground Water	74.3	N	0.0	N	0	None	Ground Water
Tidwell Bottom	51.0-52.5	T26S	R17E	25	162.9	N	0.0	N	0	None	Ground Water	162.9	N	0.0	N	0	None	Ground Water
Horsethief Bottom	50.0-51.5	T26S	R17E	26	32.1	N	0.0	N	0	None	Ground Water	32.1	N	0.0	N	0	None	Ground Water
Woodruff Bottom	49.0-50.0	T26S	R17E	26	81.1	N	0.0	N	0	None	Ground Water	81.1	N	0.0	N	0	None	Ground Water
Point Bottom	47.5-49.5	T26S	R17E	34	32.7	N	0.0	N	0	None	Ground Water	32.7	N	0.0	N	0	None	Ground Water
Saddle Horse Bottom	45.5-47.5	T27S	R17E	2	14.0	N	0.0	N	0	None	Ground Water	14.0	N	0.0	N	0	None	Ground Water
Horsethief Canyon	45.0-46.0	T27S	R17E	2	69.6	N	0.0	N	0	None	Ground Water	69.6	N	0.0	N	0	None	Ground Water
Horsethief-Upheaval Bottom	44.0-45.5	T27S	R17E	12	104.7	N	0.0	N	0	None	Ground Water	104.7	N	0.0	N	0	None	Ground Water
Upheaval Bottom/Canyon	43.5-44.5	T27S	R17E	13	78.3	Y	1.4	N	0	None	Ground Water	78.3	N	0.0	N	0	None	Ground Water
Hardscrabble Bottom	42.5-43.5	T27S	R17E	4	30.7	N	0.0	N	0	None	Ground Water	30.7	N	0.0	N	0	None	Ground Water
Hardscrabble-Fort Bottoms	38.5-42.5	T27S	R17E	22	156.2	Y	1.9	N	0	None	Ground Water	156.2	N	0.0	N	0	None	Ground Water
Potato Bottom	35.5-38.0	T27S	R17E	26	76.8	N	0.0	N	0	None	Ground Water	76.8	N	0.0	N	0	None	Ground Water

[a] Browns Park National Wildlife Refuge.
[b] Water enters bottomland through a water control structure and then is gravity fed through the system.
[c] Water enters bottomland either from flooding over the bank and/or seepage from ground water. The water in some agricultural areas comes from sprinkler run-off.
[d] Ouray National Wildlife Refuge.

Table E.2. Continued.

Basin: Upper Colorado River

Sub-basin: Green River

River: Green River

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Site	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Y/N	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Natural/Man-Made	Width/ Distance ft (m)	Vegetation (Y/N)	Vegetation Predominant Type(s)	Proximity to Endangered Fishes[a] RM	Proximity to Endangered Fishes[a] Species	Proximity to Endangered Fishes[a] Life Stage	Bottomland Description	Land Ownership	Photo Imagery Type	Photo Imagery Catalog No.[b]
Fivemile Wash/Little Valley	N	-	-	N	-	199.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	14:24, 56:15
Downstream of Ninemile Wash	N	-	-	N	-	201.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	14:26, 56:16-17
Anvil Bottom	N	-	-	N	-	208.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	14:34, 56:29-30
Upstream of San Rafael River	N	-	-	N	-	212.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	14:37, 56:32
San Rafael River confluence	N	-	-	N	-	213.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:6, 56:33
White and Red Wash	N	-	-	N	-	214.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:8, 56:35-36
Between Red Wash and Bull Bottom	N	-	-	N	-	215.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:9
Bull Bottom-Labyrinth Canyon	N	-	-	N	-	218.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:11, 57:2-3
Labyrinth Canyon confluence	N	-	-	N	-	218.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:12, 57:4
Three Canyon/Trin-Alcove Bend	N	-	-	N	-	219.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:13, 57:5
Junes Bottom	N	-	-	N	-	223.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:14, 57:6-7
Junes Bottom-Bull Hollow	N	-	-	N	-	225.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:15-16, 57:8-12
Bull Hollow	N	-	-	N	-	226.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:17, 57:13-17
Bull Hollow-Tenmile Canyon	N	-	-	N	-	228.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:18, 57:14-17
Tenmile Canyon and Bottom	N	-	-	N	-	229.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:19, 57:18-20
Keg Springs Canyon	N	-	-	N	-	232.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:21-22, 57:21-22
Hey Joe Canyon	N	-	-	N	-	235.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:23, 57:23-24
Hey Joe Canyon-Spring Canyon	N	-	-	N	-	236.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:24, 57:25-26
Spring Canyon Point	N	-	-	N	-	237.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:25-26, 57:27-30
Bowknot Bend	N	-	-	N	-	241.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:27-34, 57:31-36, 58:1-6
Twomile Canyon-Deadman Point	N	-	-	N	-	249.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:35, 58:6-7
Deadman Point-Horseshoe Canyon	N	-	-	N	-	251.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:36, 58:8
Downstream of Horseshoe Canyon	N	-	-	N	-	252.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	15:37, 58:9-13
Cottonwood Bottom	N	-	-	N	-	254.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:1, 58:14-16
Cottonwood-Mineral Bottoms	N	-	-	N	-	256.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:2, 58:17-19
Mineral-Tidwell Bottoms	N	-	-	N	-	257.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:3, 58:19-20
Tidwell Bottom	N	-	-	N	-	258.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:4-6, 58:21
Horsethief Bottom	N	-	-	N	-	259.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:7, 58:21-23
Woodruff Bottom	N	-	-	N	-	261.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:8, 58:23
Point Bottom	N	-	-	N	-	261.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:9-10
Saddle Horse Bottom	N	-	-	N	-	263.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:11-12, 58:24-26
Horsethief Canyon	N	-	-	N	-	265.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:13, 58:25
Horsethief-Upheaval Bottom	N	-	-	N	-	265.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:14, 58:26
Upheaval Bottom and Canyon	N	-	-	N	-	266.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:15, 58:27
Hardscrabble Bottom	N	-	-	N	-	267.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:16, 58:28-30
Hardscrabble-Fort Bottoms	N	-	-	N	-	268.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:17-18, 58:31-35
Potato Bottom	N	-	-	N	-	273.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:19-20, 58:36-37, 59:1-4

[a] The only known spawning site is located at river mile 311 at Razorback bar.
[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6:1-3 = roll 6, pictures 1 through 3).
[c] Browns Park National Wildlife Refuge.
[d] The most common emergent vegetation consists of Cattail, Inland Salt Grass, and White Top.
[e] Located upstream of Razorback bar spawning area.
[f] A portion of the bottomland is privately and Federally owned.

Table E.1. Continued.

Basin: Upper Colorado River

Sub-basin: Green River

River: Green River

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Location					Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area Acres (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area Acre (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Potato-Beaver Bottoms	34.5-35.5	T28S	R17E	2	44.2	N	0.0	N	0	None	Ground Water	44.2	N	0.0	N	0	None	Ground Water
Beaver-Queen Ann Bottoms	33.5-34.5	T28S	R17E	11	49.1	Y	5.1	N	0	None	Ground Water	49.1	N	0.0	N	0	None	Ground Water
Queen Ann Bottom	33.0-34.0	T28S	R17E	11	68.8	Y	2.4	N	0	None	Ground Water	68.8	Y	0.0	N	0	None	Ground Water
Queen Ann-Anderson Bottoms	32.0-33.0	T28S	R17E	14	15.0	N	0.0	N	0	None	Ground Water	15.0	Y	0.0	N	0	None	Ground Water
Anderson Bottom	30.0-31.5	T28S	R17E	24	23.3	Y	2.1	N	0	None	Ground Water	23.3	Y	4.8	Y	0	None	Ground Water
Unknown and Valentine Bottoms	29.0-32.0	T28S	R17E	12	112.2	N	0.0	N	0	None	Ground Water	112.2	Y	0.0	N	0	None	Ground Water
Valentine Bottom	27.0-29.0	T28S	R18E	7	117.8	Y	1.3	N	0	None	Ground Water[c]	117.8	Y	0.0	N	0	None	Ground Water
Stillwater Canyon-Sphinx	26.0-28.5	T28S	R18E	18	96.3	Y	17.7	N	0	None	Ground Water	96.3	Y	0.0	N	0	None	Ground Water
Downstream Valentine Bottom	25.5-26.5	T28S	R18E	19	67.6	Y	45.5	N	0	None	Ground Water	67.6	Y	0.0	N	0	None	Ground Water
Valentine-Tuxedo Bottoms	24.0-25.5	T28S	R18E	20	96.9	N	0.0	N	0	None	Ground Water	96.9	Y	0.0	N	0	None	Ground Water
Tuxedo Bottom-Turks Head	19.5-24.0	T28S	R18E	21	235.9	Y	4.0	N	0	None	Ground Water	235.9	Y	0.0	N	0	None	Ground Water
Deadhorse Canyon confluence	18.5-20.0	T28S	R18E	32	26.3	Y	1.6	N	0	None	Ground Water	26.3	Y	0.0	N	0	None	Ground Water
Downstream Deadhorse Canyon	17.0-19.0	T29S	R18E	4	57.8	Y	2.6	N	0	None	Ground Water	57.8	Y	0.0	N	0	None	Ground Water
Deadhorse-Horse Canyons	16.0-17.0	T29S	R18E	20	21.3	N	0.0	N	0	None	Ground Water	21.3	Y	0.0	N	0	None	Ground Water
Horse Canyon	13.5-14.0	T29S	R18E	27	51.7	Y	7.4	N	0	None	Ground Water	51.7	Y	0.0	N	0	None	Ground Water
Downstream of Horse Canyon	12.5-13.5	T29S	R18E	26	32.6	N	0.0	N	0	None	Ground Water	32.6	Y	0.0	N	0	None	Ground Water
Horse and Jasper Canyons	10.5-12.5	T29S	R18E	26	60.4	Y	2.3	N	0	None	Ground Water	60.4	Y	0.0	N	0	None	Ground Water
Jasper Canyon	8.0-10.5	T29S	R18E	35	55.8	Y	1.8	N	0	None	Ground Water	55.8	Y	0.0	N	0	None	Ground Water
Jasper and Short Canyons	5.0-8.0	T30S	R18E	2	33.5	Y	0.6	N	0	None	Ground Water	33.5	Y	0.0	N	0	None	Ground Water
Short Canyon-Colorado River	2.0-3.5	T30S	R19E	6	13.8	Y	2.0	N	0	None	Ground Water	13.8	Y	0.0	N	0	None	Ground Water
Upstream of Colorado River	1.0-2.0	T30S	R18E	23	14.8	Y	0.6	N	0	None	Ground Water	14.8	Y	0.0	N	0	None	Ground Water
Near Colorado R. confluence	0.5-1.5	T30S	R18E	25	29.0	Y	0.5	N	0	None	Ground Water	29.0	Y	0.0	N	0	None	Ground Water
Colorado River confluence	0.0-0.5	T30S	R19E	7	15.6	N	0.0	N	0	None	Ground Water	15.6	Y	0.0	N	0	None	Ground Water

[a] Browns Park National Wildlife Refuge.

[b] Water enters bottomland through a water control structure and then is gravity fed through the system.

[c] Water enters bottomland either from flooding over the bank and/or seepage from ground water. The water in some agricultural areas comes from sprinkler run-off.

[d] Ouray National Wildlife Refuge.

Table E.2. Continued.

Basin: Upper Colorado River
Sub-basin: Green River
River: Green River

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Site	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Y/N	Natural/Man-Made	Width/ Distance ft (m)	Vegetation (Y/N)	Vegetation Predominant Type(s)	Proximity to Endangered Fishes[a] RM	Species	Life Stage	Bottomland Description	Land Ownership	Photo Imagery Type	Catalog No.[b]
Potato-Beaver Bottoms	N	-	-	N	-	275.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:21
Beaver-Queen Ann Bottoms	N	-	-	N	-	276.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:22
Queen Ann Bottom	N	-	-	N	-	277.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:23
Queen Ann-Anderson Bottoms	N	-	-	N	-	278.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:24
Anderson Bottom	N	-	-	N	-	279.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:25
Unknown and Valentine Bottoms	N	-	-	N	-	279.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:26-27
Valentine Bottom	N	-	-	N	-	282.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:29, 59:13-18
Stillwater Canyon and Sphinx	N	-	-	N	-	282.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:30-31, 59:16-20
Downstream of Valentine Bottom	N	-	-	N	-	284.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:32, 59:19-22
Valentine-Tuxedo Bottoms	N	-	-	N	-	285.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:33, 59:21-23
Tuxedo Bottom	N	-	-	N	-	287.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	16:34-37, 17:1-3, 59:23-29
Deadhorse Canyon confluence	N	-	-	N	-	291.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:4, 59:29
Downstream of Deadhorse Canyon	N	-	-	N	-	292.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:5-7, 59:30-32
Deadhorse and Horse Canyons	N	-	-	N	-	294.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:8, 59:33
Horse Canyon	N	-	-	N	-	297.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:9-11, 59:36-37
Downstream of Horse Canyon	N	-	-	N	-	297.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:12-13, 60:1-2
Horse Canyon and Jasper Canyon	N	-	-	N	-	298.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:14-15, 60:3
Jasper Canyon	N	-	-	N	-	300.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:16-20, 60:7
Jasper Canyon and Shot Canyon	N	-	-	N	-	303.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:21-23, 60:9-10
Short Canyon and Colorado River	N	-	-	N	-	307.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:24-25, 60:12-13
Upstream of Colorado River	N	-	-	N	-	309.0	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:26-29, 60:14
Near Colorado River confluence	N	-	-	N	-	309.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:30-31, 60:15-16
Colorado River confluence	N	-	-	N	-	310.5	Razorback	Larval	Flood-Plain Terrace	Federal	35mm	17:32-37, 60:16

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[a] The only known spawning site is located at river mile 311 at Razorback bar.
[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6:1-3 = roll 6, pictures 1 through 3).
[c] Browns Park National Wildlife Refuge.
[d] The most common emergent vegetation consists of Cattail, Inland Salt Grass, and White Top.
[e] Located upstream of Razorback bar spawning area.
[f] A portion of the bottomland is privately and Federally owned.

Table E.3. The 10 parameters from 35-mm color slide photo-imagery used to categorize and rank bottomlands important to endangered fishes in the Yampa River, Colorado (Part 1).

Basin: Upper Colorado River
Sub-basin: Green River
River: Yampa River

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Location					Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area Acres (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area Acre (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Upstream Snake R. confluence	48.0-48.5	T6N	R98W	19	21.9	Y	21.9	Y	2	Both	Ground Water[c]	21.9	N	0.0	N	0	None	Ground Water

[a] Browns Park National Wildlife Refuge.
[b] Water enters bottomland through a water control structure and then is gravity fed through the system.
[c] Water enters bottomland either from flooding over the bank and/or seepage from ground water. The water in some agricultural areas comes from sprinkler run-off.
[d] Ouray National Wildlife Refuge.

Table E.4. The 10 parameters from 35-mm color slide photo-imagery used to categorize and rank bottomlands important to endangered fishes in the Yampa River, Colorado (Part 2).

Basin: Upper Colorado River
Sub-basin: Green River
River: Yampa River

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	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland		Width/ Distance	Vegetation		Proximity to Endangered Fishes[a]			Predominate Geological	Land	Photo Imagery	
Site	Y/N	Natural/Man-Made	ft (m)	(Y/N)	Predominate Type(s)	RM	Species	Life Stage	Description	Ownership	Type	Catalog No.[b]
Upstream Snake River confluence	N	-	-	N	-	82.5[e]	Razorback	Larval	Flooded Side Channel	Private	35mm	1:6, 30:12

[a] The only known spawning site is located at river mile 311 at Razorback bar.
[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6:1-3 = roll 6, pictures 1 through 3).
[c] Browns Park National Wildlife Refuge.
[d] The most common emergent vegetation consists of Cattail, Inland Salt Grass, and White Top.
[e] Located upstream of Razorback bar spawning area.
[f] A portion of the bottomland is privately and Federally owned.

Table E.5. The 10 parameters from 35-mm colored slide photo-imagery used to categorize and rank bottomlands important to endangered fishes in the White River, Colorado and Utah (Part 1).

Basin: Upper Colorado River
Sub-basin: Green River
River: White River

Page: 10

Location					Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area Acres (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area Acre (ha)	Inundated (Y/N)	Total Area Inundated Acres (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Oxbow downstream Highway 64	91.0-93.0	T1N	R102W	4	18.9	Y	18.9	Y	2	Both	Ground Water[c]	18.9	Y	17.6	Y	2	Both	Ground Water
White/Green River confluence	0.0-2.5	T9S	R20E	4	614.7	Y	496.4	N	0	None	Ground Water	614.7	N	0.0	N	0	None	Ground Water

[a] Browns Park National Wildlife Refuge.
[b] Water enters bottomland through a water control structure and then is gravity fed through the system.
[c] Water enters bottomland either from flooding over the bank and/or seepage from ground water. The water in some agricultural areas comes from sprinkler run-off.
[d] Ouray National Wildlife Refuge.

Table E.6. The 10 parameters from 35-mm colored slide photo-imagery used to categorize and rank bottomlands important to endangered fishes in the White River, Colorado and Utah (Part 2).

Basin: Upper Colorado River
Sub-basin: Green River
River: Yampa River

Page: 10

	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland			Vegetation		Proximity to Endangered Fishes[a]					Photo Imagery	
Site	Y/N	Natural/Man-Made	Width/ Distance ft (m)	(Y/N)	Predominant Type(s)	RM	Species	Life Stage	Bottomland Description	Land Ownership	Type	Catalog No.[b]
Oxbow downstream of Highway 65	N	-	-	N	-	156.0	Razorback	Larval	Flooded Side Channel	Private	35mm	5:7, 70:16-17
White/Green River confluence	Y	Man-Made	N-10	Y	Emergent	65.0	Razorback	Larval	Flood-Plain Terrace	Tribe	35mm	3:1-4, 68:1-2

[a] The only known spawning site is located at river mile 311 at Razorback bar.
[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6:1-3 = roll 6, pictures 1 through 3).
[c] Browns Park National Wildlife Refuge.
[d] The most common emergent vegetation consists of Cattail, Inland Salt Grass, and White Top.
[e] Located upstream of Razorback bar spawning area.
[f] A portion of the bottomland is privately and Federally owned.

Table E.7. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

Page: 1

					Runoff (May 1993)							Post-Runoff (September 1993)						
	Location							Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Rifle West	238.0-241.1	6S	93W	16,17	150.7	Y	12.2	N	0	None	None	150.7	Y	12.1	N	0	None	None
Rifle I-70 West Interchange	236.5-238.0	6S	93W	13,18	126.4	Y	5.3	N	0	None	None	126.4	Y	5.3	N	0	None	None
CDOW/Gentry Property	234.2-235.8	6S 6S	94W 94W	24 23,24 27	66.8	Y	10.4	N	0	None	None	66.8	Y	10.2	N	0	None	None
"Trash-can Pond"	230.2-230.8	6S	94W	30	5.8	Y	5.3	Y	2	Both	None	5.8	Y	1.8	N	0	None	None
Mahaffey/Lemon	228.2-229.8	6S	94W	25 35,36	54.4	Y	6.5	Y	4	Both	Springs Irrigation	54.4	Y	2.3	Y	2	Both	Springs Irrigation
Mahaffey's	228.5-229.5	6S	94W	25,26	30.5	Y	2.5	Y	1	Up	None	30.5	Y	2.2	Y	1	Up	None
Hoaglund's	227.1-227.7	6S	94W	2,35	16.4	Y	1.2	Y	2	Both	Springs Irrigation	16.4	Y	< 0.1	Y	1	Dn	Springs Irrigation
Dere/Ortiz	227.5-228.5	6S	94W	35	39.3	Y	6.1	Y	1	Up	None	39.3	Y	6.0	N	0	None	None
Parachute East	223.1-225.1	6S	94W	5	35.7	Y	14.2	Y	4	Both	None	35.7	Y	2.5	Y	4	Both	None
Knight's	224.5-225.4	6S	94W	4,5	28.2	Y	4.4	Y	1	Up	Springs	28.2	N	0	N	0	None	None
Parachute Bridge	223.0-223.4	7S	95W	7	13.7	Y	2.1	Y	2	Both	None	13.7	Y	0.7	Y	1	Dn	Springs
"No-name"	222.7-223.1	7S	95W	18	8.6	Y	0.4	N	0	None	Springs	8.6	Y	0.8	Y	1	Dn	Springs
"No-name"	221.1-222.9	7S	95W	7,18	23.4	Y	11.5	N	0	None	Groundwater	23.4	Y	11.3	N	0	None	None
Battlement Mesa	220.7-221.7	7S	96W	13,24	34.4	Y	10.2	Y	4	Both	Groundwater	34.4	Y	3.9	Y	1	Dn	Springs
EXXON	218.9-220.1	7S	96W	23	34.9	Y	3.1	Y	1	Dn	None	34.9	Y	0	N	0	None	None
Doyle Property	218.4-219.5	7S	96W	23	8.7	N	0	N	0	None	None	8.7	N	0	N	0	None	None
"No-name"	217.2-218.0	7S	96W	26,27	22.3	Y	1.4	Y	2	Both	None	22.3	Y	0	N	0	None	None

Table E.7. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

Page: 2

	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland		Levy/Berm		Vegetation	Proximity to Endangered Species			Predominant Floodplain		Photo Imagery	
Site	Y/N	Natural/Man-made	Width/ Length (m)	Y/N	Predominant Type(s)	RM	Species	Life Stage	Habitat Type	Land Ownership	Type[a]	Catalog No.[b]
Rifle West	Y	Man-made	3,901-L	Y	Cottonwood	185.1	CS	Adult	Gravel-Pit Ponds	Private	ASCS	20: 1-4; 74: 2-3
Rifle I-70 West Interchange	Y	Man-made	1,463-L	N	None	185.1	CS	Adult	Gravel-Pit Ponds	Private	ASCS	20: 5-6; 74: 5-6
CDOW/Gentry Property	Y	Man-made	650-L	N	None	185.1	CS	Adult	Gravel-Pit Ponds	Public	ASCS	20: 8-9; 74: 11-12
"Trash-can Pond"	Y	Man-made	76-L	Y	Cottonwood	185.1	CS	Adult	Gravel-Pit Pond	Private	COE ASCS	CR-27-3 (6/24/82) 74: 15
Mahaffey/Lemon	N	—	–	Y	Tamarisk	185.1	CS	Adult	Terrace	Private	ASCS	20: 13; 74: 15-16
Mahaffey's	N	—	–	Y	Tamarisk	185.1	CS	Adult	Gravel-Pit Pond	Private	ASCS	20: 13; 74-16
Hoaglund's	N	—	–	Y	Tamarisk	185.1	CS	Adult	Terrace	Private	ASCS	20: 15; 74: 18-19
Dara/Ortiz	Y	Man-made	244-L	Y	Tamarisk	185.1	CS	Adult	Gravel-Pit Ponds	Private	ASCS	20: 14; 74: 17-18
Parachute East	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Private	ASCS	20: 18; 74: 2
Knight's	Y	Man-made	61-L	N	—	185.1	CS	Adult	Ponds	Private	COE ASCS	CR 26-1 (6-24-82) 74: 20
Parachute Bridge	N	—	–	Y	Tamarisk	185.1	CS	Adult	Terrace	Private	ASCS	20: 20; 74: 21
"No-name"	M	—	–	Y	Cottonwood/Tamarisk	185.1	CS	Adult	Terrace	Private	ASCS	20: 18; 74: 22
"No-name"	Y	Man-made	1,707-L	N	—	185.1	CS	Adult	Gravel-Pit Ponds	Private	ASCS	20: 20; 74: 23
Battlement Mesa	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Private	COE ASCS	CR-24-1 (6/24/82) 74: 24
EXXON	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Private	ASCS	20: 21; 75: 2
Doyle Property	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Private	ASCS	20: 22; 75: 2
"No-name"	Y	Man-made	1,097-L	N	—	185.1	CS	Adult	Terrace	Private	ASCS	20: 25; 75: 4

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.8. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

Page: 3

					Runoff (May 1993)							Post-Runoff (September 1993)							
	Location				Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	Hydrological Connection to River				Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	Hydrological Connection to River			
Site	RM	T	R	S				(Y/N)	No.	Up/Down Stream	Other Water Sources				(Y/N)	No.	Up/Down Stream	Other Water Sources
Una North	216.4-217.4	7S	96W	33,34	40.7	Y	6.4	N	0	None	None	40.7	Y	6.3	N	0	None	None
Wallace Creek Island	215.9-216.5	7S	96W	33	13.3	Y	3.4	Y	2	Both	None	13.3	N	0	N	0	None	None
Stoddard Property	209.4-210.1	8S	97W	26,27	23.2	Y	8.1	N	0	None	None	23.2	Y	8.1	N	0	None	None
Debeque I-70 Slough	209.6-211.4	8S	97W	22,23	40.4	Y	6.7	Y	2	Both	None	40.4	Y	3.6	Y	1	Dn	None
				24														
Latham's	207.9-208.8	8S	97W	33	26.1	Y	6.2	Y	2	Both	Irrigation	26.1	Y	1.6	N	0	None	Irrigation
"No-name"	206.2-207.5	8S	97W	32,33	22.9	Y	2.1	Y	2	Both	None	22.9	N	0	N	0	None	None
Etter's	204.7-206.8	8S	97W	33	65.1	Y	22.8	Y	2	Both	None	65.1	Y	22.8	Y	1	Dn	Irrigation
"No-name"	202.3-204.2	9S	97W	8,17	86.4	Y	6.9	Y	2	Both	None	86.4	Y	3.3	N	0	None	None
				18														
"No-name"	201.9-202.4	9S	97W	19,20	6.1	Y	0.2	Y	2	Both	Groundwater	6.1	N	0	N	0	None	None
Long Point Bottom	198.0-198.9	9S	97W	31,36	10.6	Y	2.3	Y	4	Both	None	2.3	Y	0.2	Y	1	Dn	None
Beavertail	194.3-195.6	10S	96W	12,13	12.6	Y	2.0	N	0	None	None	12.6	Y	1.6	N	0	None	River Seepage
Island Acres	191.1-192.1	10S	96W	23,26	28.1	Y	11.4	N	0	None	None	28.1	Y	11.4	N	0	None	None
Cameo	190.0-191.0	10S	96W	26,27	24.6	Y	1.2	Y	3	Both	None	24.6	Y	1.2	Y	1	Dn	Irrigation
Palisade	184.2-185.0	1S	2E	3	22.0	Y	2.5	N	0	None	None	22.0	Y	2.1	N	0	None	None
"No-name"	183.3-184.3	1S	2E	3,4	17.2	Y	3.8	Y	1	Dn	Irrigation	17.2	Y	1.3	N	0	None	Irrigation
Labor Camp	182.9-183.8	1S	2E	4	19.6	Y	8.3	Y	4	Both	None	19.6	Y	2.7	Y	1	Dn	Irrigation
"No-name"	181.6-182.6	1S	2E	5,8	43.3	Y	0.6	N	0	None	None	43.3	N	0	N	0	None	None
"No-name"	181.7-182.2	1S	2E	8	6.9	Y	2.8	Y	2	Both	Irrigation	6.9	Y	2.8	Y	2	Both	Irrigation
"No-name"	180.4-181.5	1S	2E	7,8	21.2	Y	4.2	N	0	None	Irrigation	21.1	Y	1.4	N	0	None	Irrigation
Clifton Water Treatment	179.1-181.1	1S	2E	7	122.5	Y	20.7	Y	1	Dn	Irrigation	122.5	Y	17.8	Y	1	Dn	Irrigation
		1S	1E	13														
Clifton Pond	177.7-178.2	1S	1E	14,23	81.7	Y	21.7	N	0	None	Irrigation	81.7	Y	15.6	Y	2	Both	Irrigation
Corn Lake	176.6-177.7	1S	1E	22,23	38.6	Y	14.5	Y	2	Both	None	38.6	Y	8.3	Y	1	Dn	None
Humphrey's	175.3-176.6	1S	1E	20,21	86.2	Y	47.9	Y	4	Both	Irrigation	86.2	Y	25.0	Y	1	Dn	Irrigation

Table E.8. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

Page: 4

Site	Levy/Berm: Levy or Berm Dividing Mainstem and Bottomland Y/N	Levy/Berm: Levy or Berm Dividing Mainstem and Bottomland Natural/Man-made	Levy/Berm: Width/ Length (m)	Vegetation Y/N	Vegetation Predominant Type(s)	Proximity to Endangered Species RM	Proximity to Endangered Species Species	Proximity to Endangered Species Life Stage	Predominant Flood plain Habitat Type	Land Ownership	Photo Imagery Type[a]	Photo Imagery Catalog No.[b]
Una North	Y	Man-made	1,097-L	N	—	185.1	CS	Adult	Gravel-Pit Pond	Private	ASCS	20: 28; 785: 5
Wallace Creek Island	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Private	ASCS	20: 27
Stoddard	Y	Man-made	610-L	N	—	185.1	CS	Adult	Gravel-Pit Pond	Private	ASCS	20: 37; 75: 14
Debeque I-70 Slough	Y	Man-made	769-L	Y	Cottonwood	185.1	CS	Adult	Side Channel	Public	ASCS	20: 36-37; 75: 13-14
Latham's	Y	Man-made	155-L	Y	Cottonwood	185.1	CS	Adult	Terrace/Ponds	Private	ASCS	21: 2; 75: 15
"No-name"	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Private	ASCS	21: 6; 75: 17
Etter's	Y	Man-made	182-L	Y	Cottonwood/Tamarisk	185.1	CS	Adult	Gravel Pit Pond	Private	ASCS	21: 6-7; 75: 18
						Etter Pond	RZ?	Adult				
"No-name"	N	—	–	Y	Cottonwood	185.1	CS	Adult	Terrace	Public	ASCS	21: 9-10; 75: 21
"No-name"	N	—	–	Y	Tamarisk	185.1	CS	Adult	Terrace	Private	ASCS	21: 12; 75-22
Long Point Bottom	N	—	–	Y	Tamarisk	185.1	CS	Adult	Terrace	Public	ASCS	21: 16; 75: 24-25
Beavertail	Y	Man-made	305-L	Y	Cottonwood	185.1	CS	Adult	Terrace	Private; Public	ASCS	21-19; 78: 4
Island Acres	Y	Man-made	1,463-L	N	—	185.1	CS	Adult	Gravel-Pit Ponds	Public	ASCS	21: 23; 78: 7-8
Cameo	Y	Man-made	396-L	Y	Cottonwood	185.1	CS	Adult	Terrace	Public	ASCS	21: 24; 78: 9
Palisade	Y	Man-made	1,525-L	Y	Cottonwood	171.0-185.0	CS	Adult	Sewage Ponds	Private	ASCS	21: 32; 78: 14
"No-name"	N	—	–	Y	Cottonwood/Tamarisk	171.0-185.1	CS	Adult	Terrace	Private	ASCS	21: 32; 78: 14
Labor Camp	N	—	–	N	—	171.0-185.1	CS	Adult	Side Channel	Private	ASCS	21: 33; 78: 15
"No-name"	N	—	–	Y	Agricultural Row Crops	171.0-185.1	CS	Adult	Terrace; Ponds	Private	ASCS	21: 34; 78: 16
"No-name"	N	—	–	Y	Cottonwood	171.0-185.1	CS	Adult	Terrace	Private	ASCS	21: 35; 78: 17
"No-name"	N	—	–	Y	Cottonwood	171.0-185.1	CS	Adult	Terrace	Private	ASCS	21: 36; 78: 18
Clifton Water Treatment	Y	Man-made	1,433-L	Y	Cottonwood	171.0-185.1	CS	Adult	Oxbow	Private	ASCS	22: 1-2; 78: 19-21
Clifton Pond	Y	Man-made	792-L	Y	Cottonwood	171.0-185.1	CS	Adult	Gravel-Pit Pond	Private; Public	ASCS	22: 2-3; 78: 22-23
Corn Lake	Y	Man-made	640-L	Y	Cottonwood	171.0-185.1	CS	Adult	Gravel-Pit Pond	Private; Public	ASCS	22: 4; 78: 24
Humphrey's	Y	Man-made	1,280-L	Y	Cottonwood	171.0-185.1	CS	Adult	Gravel-Pit Pond	Private; Public	ASCS	22: 5-6; 78: 25

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.9. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

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Location					Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Griffith's	174.1-176.5	1S	1E	20,21 22,29	52.7	Y	24.2	Y	6	Both	Irrigation	52.7	Y	2.6	Y	1	Dn	Irrigation
"Hotspot Junction" (30-29 Road)	173.9-175.1	1S	1E	20	97.9	Y	11.3	N	1	Dn	Irrigation Groundwater	97.9	N	9.4	N	0	None	Irrigation
"No-name"	173.4-173.8	1S	1E	19	10.6	Y	1.4	Y	2	Both	Irrigation Groundwater	10.6	Y	0.8	Y	2	Both	Irrigation
"No-name"	173.0-173.6	1S	1E	19	7.8	N	0	N	0	None	None	7.8	N	0	N	0	None	None
Mill Tailing Site	172.5-173.4	1S	1E	19	40.6	Y	1.9	Y	2	Both	Irrigation	40.6	Y	< 0.1	N	0	None	Irrigation
Watson Island	171.0-172.1	1S	1W	23,24	20.6	Y	9.3	Y	4	Both	None	20.6	Y	4.6	Y	3	Both	None
"No-name"	171.3-171.8	1S	1W	23	5.9	Y	3.0	Y	2	Both	None	5.9	Y	0.4	Y	1	Dn	Irrigation
"No-name"	170.4-171.0	1S	1W	18,22	16.4	Y	11.2	Y	8	Both	None	16.4	N	0	N	0	None	None
Connected Lakes Area	168.7-170.3	1S 11S	1W 101W	6,7,8 9,15,16 14	220.6	Y	77.2	Y	8	Both	Irrigation Return Redlands Canal	220.6	Y	59.3	Y	3	Dn	Irrigation Redls Canal
Walter Walker South	164.4-166.0	1S 11S	1W 101W	6 14	60.3	Y	28.7	Y	6	Both	Irrigation Groundwater	60.3	Y	3.0	Y	1	Dn	Irrigation
"No-name"	168.4-169.7	1S	1W	5,8,9 10,15	117.0	Y	30.7	Y	4	Both	None	117.0	Y	20.3	Y	3	Both	None
Appleton Drain East	165.1-166.4	1S	1W	5,6,8	61.1	Y	19.5	N	0	None	Irrigation	61.1	Y	17.0	N	0	None	Irrigation
Walter Walker SWA	162.7-165.1	1S	1W	6	144.5	Y	17.6	Y	2	Both	None	144.5	Y	4.7	Y	2	Dn	None
Panorama	163.1-163.6	11S 2N	101W 2W	14 35,36	20.6	Y	3.1	Y	1	Dn	Sewage Treatment Ponds	20.6	Y	2.8	Y	1	Dn	Sewage Trtmt Ponds
"No-name"	161.0-162.7	2N	2W	34,35	20.6	Y	2.5	Y	0	None	None	20.6	Y	0.9	Y	1	Dn	None
DuPont Island	161.0-162.0	2N	2W	26,27 34,35	73.9	Y	16.8	Y	3	Both	None	73.9	Y	3.6	Y	3	Both	None

Table E.9. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

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Site	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Y/N	 Natural/Man-made	 Width/ Length (m)	Vegetation Y/N	 Predominant Type(s)	Proximity to Endangered Species RM	 Species	 Life Stage	Predominant Flood plain Habitat Type	Land Ownership	Photo Imagery Type[a]	 Catalog No.[b]
Griffith's	Y	Man-made	91-L	Y	Cottonwood/Tamarisk	171.0-185.1	CS	Adult	Side Channels Terrace	Private	ASCS	22: 6-7; 78: 25; 79: 1
"Hotspot Junction" (30-29 Road)	Y	Man-made	914-L	N	None	171.0-185.1	CS	Adult	Gravel-Pit Ponds	Private; Public	ASCS	22: 7-8; 79: 1-2
"No-name"	Y	Man-made	91-L	Y	Cottonwood	171.0-185.1	CS	Adult	Gravel-Pit Pond	Private	ASCS	22: 9; 79: 3
"No-name"	N	—	—	Y	Cottonwood	171.0-185.1	CS	Adult	Terrace	Private	ASCS	22: 9; 79: 3
Mill Tailing Site	N	—	—	N	—	171.0-185.1	CS	Adult	Terrace	Private	ASCS	22: 10; 79: 4
Watson Island	Y	Man-made	183-L	Y	Cottonwood/Tamarisk	171.0-185.1	CS	Adult	Side Channel	Private; Public	ASCS	22: 11-12; 79: 5-6
"No-name"	N	—	—	Y	Tamarisk	171.0-185.1	CS	Adult	Side Channel	Private	ASCS	22: 12; 79: 6
"No-name"	N	—	—	Y	Tamarisk	152.1-171.0	CS	Adult	Side Channel	Private	ASCS	22: 13-14; 79: 7-8
Connected Lakes Area	Y	Man-made	3,810-L	Y	Cottonwood/Tamarisk	152.1-171.0	CS	Adult	Gravel-Pit Ponds	Private; Public	ASCS	22: 15-19; 79: 8-10
Walker Walker South	N	—	—	Y	Tamarisk	152.1-171.0	CS	Adult	Terrace	Private; Public	ASCS	22: 20-22; 79: 11-13
"No-name"	Y	Man-made	2,103-L	Y	Tamarisk	152.1-171.0	CS	Adult	Gravel-Pit Ponds Side Channels	Private; Public	ASCS	22: 16-19; 79: 8-10
Appleton Drain East	Y	Man-made	1,798-L	N	—	152.1-171.0	CS	Adult	Gravel-Pit Ponds	Private	ASCS	22: 19-20; 79: 11
Walker Walker SWA	Y	Man-made	991-L	Y	Tamarisk	152.1-171.0	CS	Adult	Pond	Public	ASCS	22: 22-24; 79: 13-15
Panorama	N	—	—	Y	Tamarisk	152.1-171.0	CS	Adult	Sewage Ponds	Private	ASCS	22: 23; 79: 14
"No-name"	N	—	—	Y	Tamarisk/Cottonwood	152.1-171.0	CS	Adult	Side Channel	Private	ASCS	22: 25; 79: 16
DuPont Island	N	—	—	Y	Tamarisk/Cottonwood	152.1-171.0	CS	Adult	Side Channels	Private	ASCS	22: 26; 79: 16

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93

[b] Catalog No. = photograph roll number followed by photograph numbe: (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.10. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

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	Location				Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
DuPont's	159.1-161.9	2N	2W	26,27 28,33 34	86.8	Y	37.5	Y	4	Both	Irrigation Returns	86.8	Y	25.2	Y	3	Both	Irrigation Returns
Paul Smith's	158.0-159.1	2N	2W	20,21 28,29	53.4	Y	13.8	Y	1	Dn	Irrigation Return	53.4	Y	2.4	Y	1	Dn	Irrigation Return
Fruita 340 Bridge	157.5-158.3	2N	2W	19,20	17.0	Y	0.8	Y	1	Dn	None	17.0	Y	0.4	Y	1	Up	None
Fruita Sewage Ponds	156.6-158.0	2N	2W	19,20	40.9	Y	16.8	N	0	None	Sewage Ponds	40.9	N	16.5	N	0	None	Sewage Ponds
Snook's Bottom	155.9-157.1	2N 1N	2W 3W	18,19 13	38.0	Y	1.4	Y	2	Both	None	38.0	Y	0.8	Y	1	Dn	None
Horsethief SWA	151.9-154.7	1N	3W	9,10 11,14,15	180.9	Y	4.9	Y	4	Both	Irrigation	180.9	Y	1.5	Y	2	Dn	Irrigation
Spann's	151.4-152.4	1N	3W	9,10	34.0	Y	5.2	N	0	None	None	34	N	4.7	N	0	None	None
"No-name"	150.8-151.5	1N	3W	16,17	27.5	N	0	N	0	None	None	27.5	N	0	N	0	None	None
Crow Bottom	143.9-146.5	10S	103W	8,17	96.0	N	0	N	0	None	Salt Wash	96.0	N	0	N	0	None	Salt Wash
"No-name"	145.5-146.6	10S	103W	16,17	39.7	N	0	N	0	None	None	39.7	N	0	N	0	None	None
Vulture Bottom	139.7-142.1	10S 10S	103W 104W	18 24	61.5	N	0	N	0	None	None	61.5	N	0	N	0	None	None
"No-name" Island	137.2-138.0	10S	104W	26,27	23.2	N	0	N	0	None	None	23.2	N	0	N	0	None	None
Black Rocks	136.7-137.1	10S	104W	27	17.8	Y	0.6	Y	2	Both	None	17.8	N	0	N	0	None	None
Knowles Canyon	133.6-135.0	11S 10S	104W 104W	4 32,33	52.0	Y	1.0	Y	1	Up	Gully Washers	52.0	N	0	Y	1	Up	GullyWashers

Table E.10. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

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Site	Levy/Berm: Levy or Berm Dividing Mainstem and Bottomland		Levy/Berm: Width/ Length (m)	Vegetation		Proximity to Endangered Species			Predominant Flood plain Habitat Type	Land Ownership	Photo Imagery	
	Y/N	Natural/Man-made		Y/N	Predominant Type(s)	RM	Species	Life Stage			Type[a]	Catalog No.[b]
DuPont's	Y	Man-made	2,134-L	Y	Tamarisk	152.1-171.0	CS	Adult	Gravel-Pit Ponds	Private	ASCS	22: 26-28; 79: 16-17
											U. M.	115; 121-125
Paul Smith's	Y	Man-made	1,066-L	N	—	152.1-171.0	CS	Adult	Gravel-Pit Ponds	Private	ASCS	22: 28-29; 79: 18
Fruita 340 Bridge	N	—	–	N	—	152.1-171.0	CS	Adult	Terrace	Private	ASCS	22: 29
											U. M.	130
Fruita Sewage Ponds	Y	Man-made	1,463-L	N	—	152.1-171.0	CS	Adult	Sewage Ponds	Private	ASCS	22: 30-31; 79: 19
Snook's Bottom	N	—	–	Y	Cottonwood/Tamarisk	152.1-171.0	CS	Adult	Terrace	Public	N.A.I.	NAI 3105: 10-8 (8/27/86)
Horsethief SWA	Y	Man-made	3,350-L	Y	Agricultural Row Crops; Cottonwood/Tamarisk	152.1-171.0	CS	Adult	Terrace	Public	ASCS	22: 34-36; 79: 22-23
Spann's	Y	Natural	60-L	Y	Tamarisk/Cottonwood	0.0-152.1	CS	Adult	Terrace	Private	ASCS	22: 37; 79: 24
"No-name"	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Side Channel	Private	ASCS	23: 1; 79: 25
Crow Bottom	N	—	–	Y	Cottonwood/Tamarisk	0.0-152.1	CS	Adult	Terrace	Private; Public	ASCS	23: 4-5; 80: 6, 8
						135.0-137.0	HB	Adult				
"No-name"	N	—	–	Y	Cottonwood/Tamarisk	0.0-152.1	CS	Adult	Terrace	Private	ASCS	23: 4; 80: 6
						135.0-137.0	HB	Adult				
Vulture Bottom	N	—	–	Y	Cottonwood	0.0-152.1	CS	Adult	Terrace	Public	ASCS	23: 10-11; 80: 12-13
						135.0-137.0	HB	Adult	Side Channels			
"No-name" Island	N	—	–	Y	Cottonwood	0.0-152.1	CS	Adult	Side Channel	Public	ASCS	23: 14; 80: 15
						135.0-137.0	HB	Adult				
Black Rocks	N	—	–	Y	Cottonwood	0.0-152.1	CS	Adult	Terrace	Public	ASCS	23: 15-16; 80: 15
						135.0-137.0	HB	Adult	Side Channel			
Knowles Canyon	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Terrace	Public	ASCS	23: 19; 80: 19-20
						135.0-137.0	HB	Adult				

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/26/93, 9/2/93; N.A.I. = Nichols Associates, Inc., Grand Junction, CO, 1: 24000 Black and White Aerial Photographs.

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.11. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

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					Runoff (May 1993)							Post-Runoff (September 1993)						
	Location							Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Joulas Bottom	129.8-133.9	11S 19S	104W 26E	7,8 29,30	99.6	N	0	N	0	Up	None	99.6	N	0	N	0	None	None
Wildass Canyon Ranch	127.3-131.3	19S 20S 20S	26E 26E 25E	31 6 12	189.0	Y	14.6	Y	4	Both	Irrigation	189.0	Y	1.9	Y	1	Dn	Irrigation
"No-name"	125.8-126.8	20S	25E	12,13 14	54.0	Y	0.8	Y	2	Both	None	54.0	N	0	N	0	None	None
Elizondo Ranches	126.5-127.8	20S	25E	1,12	87.1	Y	4.0	N	0	None	Groundwater	87.1	Y	1.7	N	0	None	Groundwater
Westwater Wash	124.8-126.0	20S	25E	14	84.0	Y	16.8	Y	8	Both	Westwater Wash	84.0	Y	0.2	Y	1	Dn	Irrigation Wastwtr Wash
Cisco Landing Area	107.6-111.8	21S	24E	12,14 22,26 27	267.0	Y	4.0	Y	2	Both	None	267.0	N	0	N	0	None	None
Fish Ford Area	103.0-105.9	22S	24E	2,3 10,11	100.5	Y	10.6	Y	2	Both	Gully Washers	100.5	N	0	N	0	None	GullyWashers
McGraw/Hotel Bottom	98.1-101.0	22S	24E	21,28 29,3[illegible]	123.7	Y	24.7	Y	6	Both	Sager's Wash	123.7	?	?	?	?	?	?
White Ranch	77.5-78.4	24S	22E	35	26.1	N	0	N	0	None	Castle Creek	26.1	N	0	N	0	None	Castle Creek
Courthouse Wash	63.8	25S	21E	27	2.8	Y	1.6	Y	1	Up	Gully Washer	2.8	N	0	N	0	None	Gully Washer
Moab Slough	61.5-64.0	25S 25S	21E 21E	1,2 26,27 34,35	354.0	Y	212.0 (estimate)	Y	> 6	Both	Mill Creek; Groundwater	354.0	Y	81.0 (estimate)	Y	1	Dn	Mill Creek Groundwater
Kane Spring	58.2	26S	20E	21,22	2.8	Y	1.6	Y	2	Both	Groundwater	2.8	N	0	N	0	None	None
Billboard (Lake Bottom)	50.9-52.5	26S 26S	20E 21E	1,12 6,7	36.0	Y	9.9	N	0	None	Groundwater	36.0	N	0	N	0	None	None

Table E.11. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

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	Levy/Berm			Vegetation		Proximity to Endangered Species			Predominant Flood plain Habitat	Land	Photo Imagery	
Site	Levy or Berm Dividing Mainstem and Bottomland Y/N	Natural/Man-made	Width/ Length (m)	Y/N	Predominant Type(s)	RM	Species	Life Stage	Type	Ownership	Type[a]	Catalog No.[b]
Joufles Bottom	N	—	–	Y	Tamarisk/Cottonwood	0.0-152.1	CS	Adult	Terrace	Private; Public	ASCS	23; 20-22; 80: 21-23
						135.0-137.0	HB	Adult				
Wildass Canyon Ranch	N	—	–	Y	Cottonwood/Tamarisk	0.0-152.1	CS	Adult	Terrace	Private	ASCS	23: 23-4; 80: 26
						115.0-125.0	HB	Adult	Side Channel			
"No-name"	N	—	–	Y	Cottonwood	0.0-152.1	CS	Adult	Terrace	Private; Public	ASCS	23: 27; 81: 2-3
						115.0-125.0	HB	Adult				
Elizondo Ranches	Y	Man-made	2,500-L	Y	Agricultural Row Crops	0.0-152.1	CS	Adult	Terrace	Private	ASCS	23: 26; 85: 26
						115.0-125.0	HB	Adult	Gravel Pit Ponds			
Westwater Wash	N	—	–	Y	Cottonwood	0.0-152.1	CS	Adult	Side Channel	Private	ASCS	23: 26; 81: 3-4
						115.0-125.0	HB	Adult				
Cisco Landing Area	Y	Man-made	1,922-L	Y	Cottonwood;	0.0-152.1	CS	Adult	Terrace	Private; Public	ASCS	24: 5-9; 81: 17-18
					Agricultural Row Crops	115.0-125.0	HB	Adult	Side Channel			
Fish Ford Area	N	—	–	Y	Cottonwood; Tamarisk	0.0-152.1	CS	Adult	Terrace Side Channel	Public	ASCS	24: 12-13; 81: 20-21
McGraw/Hotel Bottom	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Side Channels	Private; Public	ASCS	24: 17-19
White Ranch	Y	Natural	915-L	Y	Agricultural Crops	0.0-152.1	CS	Adult	Terrace	Private	ASCS	25: 6; 82: 21
Courthouse Wash	Y	Natural	27-L	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Private	ASCS	25: 21; 83: 11
Moab Slough	Y	Man-made	610-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	25: 22-23; 83: 12-13
		Natural	3,350-L									
Kane Spring	Y	Natural	30-L	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	25: 27; 83: 17
Billboard (Lake Bottom)	Y	Natural	1,500-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	25: 33; 83: 20

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.12. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

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	Location				Runoff (May 1993)							Post-Runoff (September 1993)						
					Total Potential Inundated Area	Inundated	Total Area Inundated	Hydrological Connection to River				Total Potential Inundated Area	Inundated	Total Area Inundated	Hydrological Connection to River			
Site	RM	T	R	S	(ha)	(Y/N)	(ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	(ha)	(Y/N)	(ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Jackson Bottom	47.4-49.0	26S	21E	24,25	34.0	Y	13.8	Y	2	Both	Groundwater	34.0	N	0	N	0	None	None
"No-name"	44.0-44.7	26S	20E	36	23.0	Y	11.4	N	0	None	Groundwater	23.0	N	0	N	0	None	None
"No-name"	42.8-43.7	27S	21E	6	22.0	Y	4.8	N	0	None	Groundwater	22.0	N	0	N	0	None	None
"No-name"	41.1-42.1	27S	20E	15	22.3	Y	10.7	N	0	None	Groundwater	22.3	N	0	N	0	None	None
"No-name"	40.2-41.3	27S	20E	22,23	21.0	Y	0.4	N	0	None	Groundwater	21.0	N	0	N	0	None	None
"No-name"	39.5-40.6	27S	20E	15,22	17.4	Y	1.2	N	0	None	Groundwater	17.4	N	0	N	0	None	None
"No-name" Canyon Mouth	38.8	27S	20E	15	1.2	Y	0.4	Y	1	Up	None	1.2	N	0	N	0	None	None
"No-name"	38.6-39.2	27S	20E	15,16	10.5	Y	0.6	N	0	None	Groundwater	10.5	N	0	N	0	None	None
Goose Neck	33.2-35.6	27S	20E	18,19 20	57.5	Y	10.1	Y	> 6	Both	Groundwater	57.5	N	0	N	0	None	None
Shafer Canyon Mouth	34.8	27S	20E	16	5.8	Y	1.2	Y	1	Up	Gully Washer	5.8	N	0	N	0	None	Gully Washer
"No-name" Canyon Mouth	32.1	27S	20E	29	1.6	Y	0.4	Y	1	Up	Gully Washer	1.6	N	0	N	0	None	Gully Washer
"No-name" Canyon Mouth	31.6	27S	20E	28	1.6	Y	0.2	Y	1	Up	Gully Washer	1.6	N	0	N	0	None	Gully Washer
"No-name"	30.8-31.9	27S	20E	28,29	27.9	Y	1.9	N	0	None	Groundwater	27.9	N	0	N	0	None	None
Little Bridge Canyon	30.0	27S	20E	30	1.8	Y	0.8	Y	1	Up	Gully Washer	1.8	N	0	N	0	None	Gully Washer
Lockhart Canyon	26.5	28S	20E	16	5.8	Y	0.6	Y	1	Up	Gully Washer	5.8	N	0	N	0	None	Gully Washer
"No-name"	25.3-26.5	28S	20E	19,20	31.0	N	7.7	N	0	None	Groundwater	31.0	N	0	N	0	None	None
Lathrop Canyon	23.5	28S	19E	13	4.5	Y	0.4	Y	1	Up	Gully Washer	4.5	N	0	N	0	None	Gully Washer
Buck Canyon	22.7	28S	19E	13	4.5	Y	0.6	Y	1	Up	Gully Washer	4.5	N	0	N	0	None	Gully Washer
Gooseberry Canyon	21.7	28S	19E	24	2.8	Y	0.4	Y	1	Up	Gully Washer	2.8	N	0	N	0	None	Gully Washer
Dogleg Canyon	21.2	28S 28S	19E 20E	25 30	3.2	Y	0.4	Y	1	Up	Gully Washer	3.2	N	0	N	0	None	Gully Washer
Sheep Bottom	17.5-18.7	29S	19E	14,23	27.3	Y	0.8	N	0	None	Groundwater	27.3	N	0	N	0	None	None
Indian Creek Canyon Mouth	16.5	29S	19E	12	4.5	Y	0.6	Y	1	Up	Gully Washer	4.5	N	0	Y	1	Up	Gully Washer
Monument Creek Mouth	15.3	29S	19E	10	5.3	Y	0.2	N	0	None	Gully Washer	5.3	N	0	Y	1	Up	Gully Washer
"No-name" Canyon Mouth	11.9	29S	19E	26	3.2	Y	< 0.1	N	0	None	Gully Washer	3.2	N	0	Y	1	Up	Gully Washer

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Table E.12. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

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Site	Levy/Berm Levy or Berm Dividing Mainstem and Bottomland Y/N	 Natural/Man-made	 Width/ Length (m)	Vegetation Y/N	 Predominant Type(s)	Proximity to Endangered Species RM	 Species	 Life Stage	Predominant Floodplain Habitat Type	Land Ownership	Photo Imagery Type[a]	 Catalog No.[b]
Jackson Bottom	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Private	ASCS	26: 3; 83: 25
"No-name"	Y	Man-made	1,220-L	N	—	0.0-152.1	CS	Adult	Gravel-Pit Ponds Depression	Private; Public	ASCS	26: 6-7; 84: 4
"No-name"	Y	Natural	1,859-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 8; 84: 7
"No-name"	Y	Natural	1,200-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 9; 84: 8
"No-name"	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 11; 84: 10
"No-name"	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 11; 84: 11
"No-name" Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 11; 84: 12
"No-name"	Y	Natural	1,400-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 11; 84: 13
Goose Neck	Y	Natural	4,000-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 15-17; 84: 17
Shafer Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 15; 84: 15
"No-name" Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 18
"No-name" Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 19; 84: 19
"No-name"	Y	Natural	1,737-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 19; 84: 19
Little Bridge Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 20; 84: 21
Lockhart Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 23; 84: 25
"No-name"	Y	Natural	2,200-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 23; 84: 25
Lathrop Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 24; 85: 2
Buck Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 25; 85: 3
Gooseberry Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 26; 85: 5
Dogleg Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 26; 85: 5
Sheep Bottom	Y	Natural	2,100-L	Y	Tamarisk	0.0-152.1	CS	Adult	Depression	Public	ASCS	26: 29; 85: 10
Indian Creek Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 30; 85: 12
Monument Creek Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26: 33; 85: 14
"No-name" Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	26; 36; 85: 20

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/26/93, 9/2/93

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.13. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Colorado River

Location					Runoff (May 1993)								Post-Runoff (September 1993)							
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
"No-name" Canyon Mouth	10.1	29S	19E	28	0.4	Y	0.2	Y	1	Up	Gully Washer	0.4	N	0	Y	1	Up	Gully Washer
Salt Creek Canyon Mouth	3.4	29.5S 30S	19E 19E	33 4	2.9	Y	< 0.1	Y	1	Up	Gully Washer	2.9	N	0	Y	1	Up	Gully Washer
Elephant Creek Canyon Mouth	3.0	29.5S	19E	33	1.7	Y	< 0.1	Y	1	Up	Gully Washer	1.7	N	0	Y	1	Up	Gully Washer

Table E.13. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Colorado River

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	Levy/Berm			Vegetation		Proximity to Endangered Species			Predominant Floodplain Habitat	Land	Photo Imagery	
	Levy or Berm Dividing Mainstem and Bottomland		Width/ Length		Predominant							
Site	Y/N	Natural/Man-made	(m)	Y/N	Type(s)	RM	Species	Life Stage	Type	Ownership	Type[a]	Catalog No.[b]
"No-name" Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	27: 4; 85: 22
Salt Creek Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	27: 12; 86: 1
Elephant Creek Canyon Mouth	N	—	–	Y	Tamarisk	0.0-152.1	CS	Adult	Canyon Mouth	Public	ASCS	27: 2; 86: 1

[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.14. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Gunnison River

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Site	Location				Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
"No-name"	74.3-74.7	14S 15S	94W 94W	36 1	24.0	N	0	N	0	None	None	24.0	N	0	N	0	None	Springs
Lawhead Gulch Bottom	70.1-71.6	15S	94W	3	13.6	Y	0.4	Y	1	Up	None	13.6	N	0	N	0	None	Gully Washer
Ferganchick's	69.6-70.5	15S	94W	4	16.7	N	0	Y	1	Up	None	16.7	N	0	N	0	None	None
"No-name"	68.3-69.4	15S	94W	4,9	12.1	N	0	Y	1	Up	Irrigation	12.1	N	0	N	0	None	Irrigation
"No-name"	67.5-68.2	15S	94W	5	3.8	N	0	N	0	None	None	3.8	N	0	N	0	None	None
Austin County Bridge	65.7-66.4	15S	94W	6	17.2	N	0	N	0	None	None	17.2	N	0	N	0	None	None
Austin Hwy 92 Bridge	65.0-65.5	15S	95W	1	13.5	Y	4.1	Y	1	Up	Irigation	4.1	N	0	N	0	None	None
"No-name"	63.3-65.3	15S	95W	1	52.2	Y	0.8	Y	1	Up	Irrigation	52.2	N	0	N	0	None	None
"No-name"	63.0-64.6	15S	95W	2,11	17.7	N	0	N	0	None	None	17.1	N	0	N	0	None	None
Colorado Hwy 65 Bridge	62.6-63.2	15S	95W	3	14.4	Y	9.9	Y	1	Up	Irrigation	14.4	N	0	N	0	None	None
Tongue Creek	61.5-62.5	15S	95W	3,4	35.6	Y	16.2	Y	1	Dn	Tongue Creek	35.6	N	0	N	0	None	Tongue Creek
Hutchin's	60.1-60.8	15S	95W	5	17.3	Y	4.8	Y	2	Dn	Irrigation	17.3	Y	1.6	N	0	None	Irrigation
North Delta	57.6-59.5	15S	95W	7,8	49.3	Y	14.0	Y	2	Up	Irrigation	49.3	N	0	N	0	None	Irrigation
South Delta	57.6-58.8	15S	95W	7,8	39.9	Y	10.0	N	0	None	Irrigation	39.9	Y	9.9	N	0	None	Irrigation
Confluence Park	56.7-57.7	15S	96W	12,13	40.1	Y	8.4	Y	2	Both	None	40.1	Y	6.7	Y	1	Dn	Irrigation
Uncompahgre R. Confluence	56.3-57.0	15S	96W	10,15	34.4	Y	8.1	Y	1	Up	Irrigation	34.4	Y	9.3	Y	1	Up	Ponds
Delta City Sewage Plant	55.6-56.5	15S	96W	10,11 14	38.0	Y	14.7	Y	1	Up	Irrigation	38.1	Y	3.6	Y	1	Up	Irrigation
"No-name"	54.6-55.5	15S	96W	10,15	27.9	Y	1.9	Y	1	Up	Irrigation	27.9	Y	1.5	Y	1	Up	Irrigation
"No-name"	54.2-55.1	15S	96W	15	28.2	Y	9.8	Y	2	Both	None	28.2	Y	2.2	Y	1	Dn	None
"No-name"	53.1-54.1	15S	96W	15,16	21.7	Y	1.3	N	0	None	None	21.7	N	0	N	0	None	None

Table E.14. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Gunnison River

Site	Levy/Berm: Levy or Berm Dividing Mainstem and Bottomland		Levy/Berm: Width/ Length (m)	Vegetation		Proximity to Endangered Species			Predominant Flood plain Habitat Type	Land Ownership	Photo Imagery	
	Y/N	Natural/Man-made		Y/N	Predominant Type(s)	RM	Species	Life Stage			Type[a]	Catalog No.[b]
"No-name"	N	—	–	Y	Tamarisk	59.1	CS	Adult	Terrace	Private	B.R. ASCS	12: 3 71: 2-3
Lawhead Gulch Bottom	N	—	–	Y	Cottonwood/Tamarisk	59.1	CS	Adult	Terrace	Private	B.R. ASCS	12: 6 71: 6
Ferganchick's	Y	Man-made	762-L	Y	Fruit Trees	59.1	CS	Adult	Terrace	Private	B.R. ASCS	12: 6 71: 6
"No-name"	Y	Man-made	2,042-L	Y	Fruit Trees	59.1	CS	Adult	Terrace	Private	B.R. ASCS	13: 4 71: 8
"No-name"	N	—	–	Y	Fruit Trees	59.1	CS	Adult	Terrace	Private	B.R.	13: 5; 1: 1
Austin County Bridge	N	—	–	Y	Cottonwood	59.1	CS	Adult	Terrace	Private	B.R.	13: 7; 2: 2
Austin Hwy 92 Bridge	N	—	–	Y	Tamarisk	59.1	CS	Adult	Terrace	Private	B.R.	13: 8; 2: 3
"No-name"	N	—	–	Y	Agricultural	59.1	CS	Adult	Terrace	Private	B.R.	14: 4; 2: 4
"No-name"	N	—	–	Y	Cottonwood	59.1	CS	Adult	Terrace	Private	B.R.	14: 5; 2: 5
Colorado Hwy 65 Bridge	N	—	–	Y	Cottonwood	59.1	CS	Adult	Terrace	Private	B.R.	14: 7; 3: 1
Tongue Creek	N	—	–	Y	Cottonwood	59.1	CS	Adult	Terrace	Private	B.R.	14: 7; 3: 2
Hutchin's	Y	Man-made	457-L	Y	Cattail/Bullrush	59.1	CS	Adult	Depression	Private	B.R.	14: 11; 3: 4
North Delta	Y	Man-made	804-L	Y	Cottonwood	3.1-59.1	CS	Adult	Gravel-Pit Ponds	Private	B.R.	15: 7; 3: 5
South Delta	Y	Man-made	1,523-L	N	—	3.1-59.1	CS	Adult	Gravel-Pit Ponds	Private	B.R.	15: 1; 4: 4
Confluence Park	Y	Natural	–	Y	Cottonwood	3.1-59.1	CS	Adult	Oxbow	Private; Public	B.R.	15: 3; 4: 5
Uncompahgre R. Confluence	Y	Man-made	460-L	N	—	3.1-59.1	CS	Adult	Ponds	Public	B.R.	15: 3; 4: 5
Delta City Sewage Plant	Y	Man-made	381-L	Y	Cottonwood/Agr Crops	3.1-59.1	CS	Adult	Terrace	Private	B.R.	15: 5; 4: 6
"No-name"	N	—	–	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Private	B.R.	15: 6; 4: 8
"No-name"	N	—	–	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Private	B.R.	15: 7; 4: 8
"No-name"	N	—	–	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Private	B.R.	15: 8; 4: 9

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/29/93, 9/2/93; B.R. = U. S. Bureau of Reclamation, 1:12000 Colored Infrared Photographs, 6/2/93, 9/28/93.

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.15. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Gunnison River

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	Location				Runoff (May 1993)							Post-Runoff (September 1993)						
								Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Johnson Boy's Slough	53.2-54.2	15S	96W	15,16	63.1	Y	9.9	Y	2	Both	None	63.1	Y	4.1	Y	1	Dn	None
Escalante SWA North	50.8-52.9	15S	96W	17,18 19	110.5	Y	28.7	Y	1	Dn	Irrigation	110.5	Y	6.0	Y	1	Up	Irrigation
Escalante SWA South	50.2-52.4	15S	96W	17,19 20	82.6	Y	46.6	Y	2	Both	Irrigation	82.6	Y	4.5	Y	1	Dn	Irrigation
"Blue Duck" Bottom	49.5-50.4	15S 15S	96W 97W	19 24	21.7	Y	6.2	Y	1	Up	None	21.7	N	0	N	0	None	None
"No-name"	49.4-49.7	15S 15S	96W 97W	19 25	11.2	Y	3.5	Y	1	Up	None	11.2	N	0	N	0	None	None
"No-name"	48.6-49.3	15S	97W	24	14.1	Y	3.5	Y	1	Up	None	14.1	N	0	N	0	None	None
"No-name"	46.6-47.5	15S	97W	14	14.2	Y	4.9	Y	2	Both	None	14.2	N	0	N	0	None	None
Escalante Ranches	41.7-42.8	15S 4S	97W 3E	10 33	15.1	Y	2.5	Y	2	Both	Escalante Creek Irrigation	15.1	N	0	N	0	None	Escalante Crk Irrigation
"No-name"	39.9-41.0	4S	3E	32	33.8	Y	16.4	Y	2	Both	None	33.8	N	0	N	0	None	None
Dominguez	36.4-36.9	14S	98W	27	11.0	Y	2.6	Y	4	Both	None	11.0	Y	1.3	Y	2	Both	None
Broughton	35.6-36.0	14S	98W	27	25.0	Y	9.4	Y	1	Up	None	25.0	N	0	N	0	None	None
McKendrick's	34.8-36.3	14S	98W	22	44.9	Y	3.5	Y	2	Both	None	44.9	N	0	N	0	None	None
Peeple's South (VIP Camp)	34.0-35.2	14S	98W	22	23.1	Y	2.9	Y	2	Dn	None	23.1	N	0	N	0	None	None
Peeple's Island	34.6-34.9	14S	98W	22	8.6	Y	5.7	Y	4	Both	None	8.6	Y	2.2	Y	2	Both	None
Sand Flat	27.3-28.7	3S	2E	33	14.5	Y	0.4	N	0	None	None	14.5	N	0	N	0	None	None
Tunnel Point	26.3-26.9	14S	99W	1,12	6.6	Y	2.8	Y	1	Up	None	6.6	N	0	N	0	None	None
Dads Flat	24.7-26.3	14S	99W	1	38.9	Y	0.2	Y	1	Dn	None	38.9	N	0	N	0	None	None
Deer Run	23.0-23.6	13S	99W	35	9.9	Y	1.5	Y	2	Both	None	9.9	Y	0.2	Y	1	Dn	None
"No-name"	22.1-22.7	13S	99W	26,27	10.0	N	0	N	0	None	None	10.0	N	0	N	0	None	None
"No-name"	21.3-21.8	13S	99W	22,27	9.3	Y	5.5	Y	2	Both	None	9.3	Y	3.4	Y	2	Both	None
"No-name"	18.4-19.2	13S	99W	10,15	4.4	Y	3.5	Y	2	Both	None	4.4	N	0	N	0	None	None

Table E.15. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Gunnison River

Site	Levy/Berm: Levy or Berm Dividing Mainstem and Bottomland Y/N	Levy/Berm: Levy or Berm Dividing Mainstem and Bottomland Natural/Man-made	Levy/Berm: Width/Length (m)	Vegetation Y/N	Vegetation Predominate Type(s)	Proximity to Endangered Species RM	Proximity to Endangered Species Species	Proximity to Endangered Species Life Stage	Predominant Flood plain Habitat Type	Land Ownership	Photo Imagery Type[a]	Photo Imagery Catalog No.[b]
Johnson Boy's Slough	Y	Man-made	725-L	Y	Greasewood	3.1-59.1	CS	Adult	Oxbow	Private	B.R.	15: 8; 4: 9
Escalante SWA North	Y	Man-made	914-L	Y	Cottonwood; Greasewood	3.1-59.1	CS	Adult	Oxbow; Side Channels	Public	B.R.	15: 9-10; 5: 4-5
Escalante SWA South	N	—	—	Y	Cottonwood	3.1-59.1	CS	Adult	Side Channels	Public; Private	B.R.	15: 9-10; 5: 4-5
"Blue Duck" Bottom	N	—	—	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Public	B.R.	16: 3; 5: 7
"No-name"	N	—	—	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Public	B.R.	16: 3; 5: 7
"No-name"	N	—	—	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Public	B.R.	16: 4; 6: 4
"No-name"	N	—	—	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Private	B.R.	16: 7; 6: 5
Escalante Ranches	Y	Man-made	61-L	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Private	B.R.	16: 12; 6: 10
"No-name"	N	—	—	Y	Cottonwood	3.1-59.1	CS	Adult	Terrace	Private; Public	B.R.	18: 4; 6: 12
Dominguez	N	—	—	Y	Tamarisk	3.1-59.1	CS	Adult	Terrace	Private	B.R.	18: 9; 8: 8
Broughton	N	—	—	Y	Cottonwood/Tamarisk	3.1-59.1	CS	Adult	Terrace	Private	B.R.	18: 10; 8: 9
McKendrick's	Y	Man-made	1,524-L	Y	Fruit Trees	3.1-59.1	CS	Adult	Terrace	Private	B.R.	18: 11; 7: 2
People's South (VIP Camp)	N	—	—	Y	Cottonwood/Tamarisk	3.1-59.1	CS	Adult	Terrace	Private	B.R.	18: 12; 7: 2
People's Island	N	—	—	Y	Cottonwood/Tamarisk	3.1-59.1	CS	Adult	Terrace	Private; Public	B.R.	18: 11; 8: 11
Sand Flat	N	—	—	Y	Cottonwood/Tamarisk	3.1-59.1	CS	Adult	Terrace	Private	B.R.	18: 17; 8: 16
Tunnel Point	N	—	—	Y	Cottonwood/Tamarisk	3.1-59.4	CS	Adult	Terrace	Public	B.R.	18: 19; 8: 18
Deds Flat	N	—	—	Y	Cottonwood/Sagebrush	3.1-59.4	CS	Adult	Terrace	Private	B.R.	18: 19; 8: 18
Deer Run	N	—	—	Y	Tamarisk/Cottonwood	3.1-59.1	CS	Adult	Terrace	Public	B.R.	20: 3; 10: 4
"No-name"	N	—	—	Y	Cottonwood/Tamarisk	3.1-59.1	CS	Adult	Terrace	Public	B.R.	20: 4; 10: 5
"No-name"	N	—	—	Y	Tamarisk	3.1-59.1	CS	Adult	Terrace	Private; Public	B.R.	20: 5; 10: 6
"No-name"	N	—	—	Y	Tamarisk/Cottonwood	3.1-59.1	CS	Adult	Terrace	Private	B.R.	21: 2; 11: 3

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93; B.R. = U. S. Bureau of Reclamation, 1:12000 Colored Infrared Photographs, 6/2/93, 9/28/93.

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

Table E.16. The 10 parameters used to rank 158 potential floodplain restoration sites important to endangered fishes of the Upper Colorado River Basin.

Basin: Upper Colorado River
Sub-basin: Colorado
River: Gunnison River

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					Runoff (May 1993)							Post-Runoff (September 1993)						
	Location							Hydrological Connection to River							Hydrological Connection to River			
Site	RM	T	R	S	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources	Total Potential Inundated Area (ha)	Inundated (Y/N)	Total Area Inundated (ha)	(Y/N)	No.	Up/Down Stream	Other Water Sources
Kannah Creek	16.0-16.6	13S	99W	9,10	13.0	Y	1.2	Y	2	Both	Kannah Creek	13.0	Y	0.4	Y	2	Both	Kannah Crk
Whitewater Biding Materials	13.3-16.0	12S 2S	99W 1E	28 14,15	70.0	Y	10.3	Y	1	Up	East Creek	70.0	N	0	N	0	None	East Crk
Duck Blind	12.7-13.8	2S 12S	1E 99W	15 26	32.0	Y	19.6	Y	1	Up	None	32.0	N	0	N	0	None	None
Bangs Canyon	11.7-13.0	12S	99W	28,29	38.5	Y	13.6	N	0	None	Bangs Canyon	38.5	Y	7.3	N	0	None	Bangs Cyn
Schroeder's	4.5-6.1	1S	1W	35,36	26.1	Y	10.3	Y	3	Both	Ponds	26.1	Y	0.8	N	0	None	Ponds
Mule Farm	3.1-3.9	1S	1W	35	31.0	Y	12.2	N	0	None	None	31.0	N	0	N	0	None	None
Redlands	2.2-3.0	1S	1W	26,27 35	4.8	Y	1.3	N	0	None	Canal Seepage	4.8	N	0	N	0	None	Canal Seepage

Table E.16. Continued.

Basin: Upper Colorado River
Sub-basin: Colorado River
River: Gunnison River

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	Levy/Berm			Vegetation		Proximity to Endangered Species					Photo Imagery	
	Levy or Berm Dividing Mainstem and Bottomland											
Site	Y/N	Natural/Man-made	Width/ Length (m)	Y/N	Predominant Type(s)	RM	Species	Life Stage	Predominant Flood plain Habitat Type	Land Ownership	Type[a]	Catalog No.[b]
Kannah Creek	Y	Man-made	610-L	Y	Tamarisk	3.1-59.1	CS	Adult	Canyon Mouth	Private	B.R.	21: 2; 11: 3
Whitewater Biding Materials	Y	Man-made	1,523-L	Y	Tamarisk/Cottonwood	3.1-59.1	CS	Adult	Gravel-Pit Ponds	Private	B.R.	21: 7; 11: 8
Duck Blind	Y	Man-made	305-L	Y	Cottonwood/Tamarisk	3.1-59.1	CS	Adult	Terrace	Private	B.R.	21: 7; 11: 8
Bangs Canyon	Y	Man-made	640-L	N	—	3.1-59.1	CS	Adult	Gravel-Pit Pond	Private	B.R.	22: 3; 12: 2
Schroeder's	Y	Man-made	610-L	Y	Tamarisk/Cottonwood	3.1-59.1	CS	Adult	Gravel-Pit Pond	Private	B.R.	22: 11; 12: 10
Mule Farm	Y	Natural	1,311-L	Y	Cottonwood; Agricultural Row Crops	3.1-59.1	CS	Adult	Terrace	Private	B.R.	23: 4; 12: 12
Redlands	N	—	—	Y	Tamarisk	0.7-3.0	CS	Adult	Terrace	Private	B.R.	23: 6; 13: 5
						CO 152.1-185.1	CS	Adult				

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[a] ASCS = Consolidated Farm Service Agency (U. S. Department of Agriculture); COE = U. S. Army Corps of Engineers; U. M. = University of Montana, 1:6000 Colored Aerial Photographs, 4/28/93, 9/2/93; B.R. = U. S. Bureau of Reclamation, 1:12000 Colored Infrared Photographs, 6/2/93, 9/28/93.

[b] Catalog No. = photograph roll number followed by photograph number (e.g. 6: 1-3 = roll 6, pictures 1 through 3).

APPENDIX F

Scoring and ranking of bottomland sites using selection criteria

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Table F.1. Selection criteria and associated sub-criteria raw score values multiplied by the average weighted point values to produce the total score and rank for each bottomland habitat site in the Green, Yampa, and White rivers, Colorado and Utah, 1993. Top 11 ranked bottomland habitats denoted by ▶ ⊓ ◀.

		Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values multiplied by Average Weighted Point Values[b]					
Site Description	River Mile	Status of land ownership	Proximity to spawn bar	June connection to river	Potential network of sites	Status of land ownership	Proximity to spawn bar	June connection to river	Potential network of sites	Total Score[c]	Rank[d]
Green River											
Sears Cr.-Allen Ranch, Browns Park NWR	388.0-392.5	1	1	3	4	1	12	15	28	56	13
Crouse Creek Browns Park NWR	381.5-382.5	3	1	3	4	3	12	15	28	58	12
Butch Cassidy lake Browns Park NWR	379.5-380.5	3	1	3	4	3	12	15	28	58	12
Hog Lake Browns Park NWR	376.5-378.0	3	1	1	4	3	12	5	28	48	14
Warren Bottom, Browns Park NWR	375.5-377.0	3	1	3	4	3	12	15	28	58	12
Spitzie Bottom, Browns Park NWR	375.0-376.0	3	1	1	4	3	12	5	28	48	14
J S Hoy Bottom, Browns Park NWR	372.0-374.0	3	1	3	4	3	12	15	28	58	12
Grimes Bottom Browns Park NWR	367.5-369.5	3	1	3	4	3	12	15	28	58	12
▶ Escalante Ranch	302.5-309.5	1	5	1	3	1	60	5	21	87	4 ◀
Meril Snow Ranch	302.0-303.0	1	5	1	3	1	60	5	21	87	4
Gravel Ponds at Jensen	301.0-302.0	1	5	1	3	1	60	5	21	87	4
Stewart Lake	299.0-300.0	2	5	1	3	2	60	5	21	88	3
Ashley Creek confluence area	297.0-298 5	2	5	1	3	2	60	5	21	88	3
Little Stewart Lake	295.5-297.5	3	5	1	3	3	60	5	21	89	2
Spring Hollow	295.0-296.0	1	5	1	3	1	60	5	21	87	4
Walker Hollow	294.0-295.0	1	5	1	2	1	60	5	14	80	6
Alhandra Ferry Site	292.0-294.0	1	5	1	2	1	60	5	14	80	6
Gravel Pits	292.0-293.0	1	5	1	2	1	60	5	14	80	6
Bonanza Bridge Area	288.5-289.0	3	5	1	2	3	60	5	14	82	5
Collier Draw	285.5-286.5	3	5	1	2	3	60	5	14	82	5
Horseshoe Bend Area	277.0-284.0	1	4	1	1	1	48	5	7	61	11
The Stirrup	274.0-277.0	3	4	1	1	3	48	5	7	63	10
Hamacker Bottom/Baeser Bend	271.0-274.0	1	4	1	3	1	48	5	21	75	9
Downstream of Baeser Bend	269.0-272.0	3	4	1	3	3	48	5	21	77	8
Upstream of Brennan Bottom	267.0-269.0	3	4	1	3	3	48	5	21	77	8
Upstream of Brennan Bottom	266.0-267.0	3	4	1	3	3	48	5	21	77	8
Brennan Bottom	262.0-266.0	1	4	1	5	1	48	5	35	89	2
Johnson Bottom, Ouray NWR	263.0-265.0	3	4	3	5	3	48	15	35	101	1
Leota Pond Complex, Ouray NWR	257.0-262.0	3	4	3	5	3	48	15	35	101	1
Wyasket Lake, Ouray NWR	253.0-257.0	3	3	3	5	3	36	15	35	89	2
Sheppard Bottom, Ouray NWR	254.0-256.0	3	3	3	5	3	36	15	35	89	2
Old Charlie Wash (main)/Woods Bottom, Ouray NWR	249.0-252.0	3	3	3	5	3	36	15	35	89	2
Old Charlie Wash (diked)/Woods Bottom, Ouray NWR	249.0-250.0	3	3	3	5	3	36	15	35	89	2
Ouray Ute pasture land	248.0-251.0	1	3	1	5	1	36	5	35	77	8
Duchesne River confluence area	248.0-249.0	1	3	1	5	1	36	5	35	77	8
White River confluence area	248.0-249.0	1	3	1	5	1	36	5	35	77	8
West Branch area	243.0-247.0	1	3	1	5	1	36	5	35	77	8
Tia Juana Bottom	242.0-244.0	1	3	1	5	1	36	5	35	77	8
Mouth of Willow Creek	239.0-241.0	3	3	1	5	3	36	5	35	79	7
▶ Pariette Draw	238.0-241.0	3	3	1	5	3	36	5	35	79	7 ◀
Desert Spring/Moon Bottom	227.0-228.0	3	2	1	1	3	24	5	7	39	17
Pourmile Wash/King Bottom	226.0-227.0	3	2	1	1	3	24	5	7	39	17
Indian Pasture/Hydes Bottom	224.0-225.0	3	2	1	1	3	24	5	7	39	17
Rays and Long Bottom	220.0-222.0	3	2	1	1	3	24	5	7	39	17
Between Long and Boat Bottom	219.0-220.0	3	2	1	1	3	24	5	7	39	17
Nine Mile Creek	213.0-214.0	3	2	1	1	3	24	5	7	39	17

[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see methods page ?).

[b] Equal to the sub-criteria raw score value * the average weighted point value (e.g., for Sears Creek-Allen Ranch this equals 1*1=1 for the status of land ownership criteria, 1*12=12 for the proximity to the spawning bar criteria. 3*5=15 for the June connection to the river criteria, and 4*7=28 for the potential of network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values * the average weighted point values (e.g., for Sears Creek-Allen Ranch this equals 1+12+15+28=56).

[d] The total score was sorted from lowest to highest with the highest total score receiving the lowest rank and lowest total score the highest rank. The lowest rank was the top priority and the highest rank the bottom prioirty

Table F.1. Continued.

		Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values multiplied by Average Weighted Point Values[b]					
Site Description	River Mile	Status of land ownership	Proximity to spawn bar	June connection to river	Potential network of sites	Status of land ownership	Proximity to spawn bar	June connection to river	Potential network of sites	Total Score[c]	Rank[d]
Green River											
Nutter Hole	211.0-213.0	3	2	1	1	3	24	5	7	39	17
Duches Hole	209.0-211.0	3	2	1	1	3	24	5	7	39	17
Tabyago Canyon/Little Horse	206.0-208.0	3	2	1	1	3	24	5	7	39	17
Little Horse Bottom	204.0-207.0	1	2	1	1	1	24	5	7	37	18
Downstream Maverick Canyon	203.0-204.0	1	2	1	1	1	24	5	7	37	18
Gold Hole	201.0-202.0	1	2	1	1	1	24	5	7	37	18
Rock House Bottom	200.0-201.0	3	2	1	1	3	24	5	7	39	17
Little Rock Canyon	199.0-200.0	3	2	1	1	3	24	5	7	39	17
Stampede Flat	198.0-199.0	1	2	1	1	1	24	5	7	37	18
Hoodoo Forms	197.0-198.0	1	2	1	1	1	24	5	7	37	18
Between Snap-Three Canyons	170.0-171.0	3	2	1	1	3	24	5	7	39	17
Chandler Falls Canyon	165.0-167.0	3	2	1	1	3	24	5	7	39	17
Trail and Bull Canyon Rapids	164.5-165.5	3	2	1	1	3	24	5	7	39	17
Joe Hutch Canyon/Rapids	160.0-161.0	3	2	1	1	3	24	5	7	39	17
Florence Creek/Three Fords	157.0-158.0	3	2	1	1	3	24	5	7	39	17
Downstream of Three Fords	153.5-155.0	3	2	1	1	3	24	5	7	39	17
Last Chance Canyon/Rapids	152.0-153.0	3	2	1	1	3	24	5	7	39	17
Range Creek Rapids	150.5-152.0	3	2	1	1	3	24	5	7	39	17
Little Big Horn Mesa	143.0-144.0	3	2	1	1	3	24	5	7	39	17
Price River confluence	137.0-138.5	3	2	1	1	3	24	5	7	39	17
Downstream of Price River	136.5-137.5	3	2	1	1	3	24	5	7	39	17
Short Canyon/Rapids	131.5-132.5	3	2	1	1	3	24	5	7	39	17
Willow Bend-Tusher Rapid	128.5-129.5	1	2	1	2	1	24	5	14	44	16
Upriver of Green River Utah	121.5-125.5	1	2	1	1	1	24	5	7	37	18
Little Grand Wash	114.5-115.5	3	2	1	1	3	24	5	7	39	17
Downstream of Grand Wash	113.0-114.0	3	2	1	1	3	24	5	7	39	17
Fivemile Wash/Little Valley	111.0-112.0	3	2	1	1	3	24	5	7	39	17
Downstream of Ninemile Wash	109.0-111.0	3	2	1	1	3	24	5	7	39	17
Anvil Bottom	101.5-102.5	3	2	1	1	3	24	5	7	39	17
Upstream of San Rafael River	98.0-99.0	3	2	1	1	3	24	5	7	39	17
Sand Rafael River confluence	96.5-97.5	3	2	1	1	3	24	5	7	39	17
White and Ped Wash	95.0-96.5	3	2	1	1	3	24	5	7	39	17
Between Red Wash-Bull Bottom	94.0-95.5	3	2	1	1	3	24	5	7	39	17
Bull Bottom-Labyrinth Canyon	92.0-93.0	3	2	1	1	3	24	5	7	39	17
Labyrinth Canyon confluence	91.5-92.5	3	2	1	1	3	24	5	7	39	17
Three Canyon/Trin-Alcove Bend	88.5-91.5	3	2	1	1	3	24	5	7	39	17
Junes Bottom	87.0-88.0	3	2	1	1	3	24	5	7	39	17
Junes Bottom-Bull Hollow	85.0-86.0	3	2	1	1	3	24	5	7	39	17
Bull Hollow	84.0-85.0	3	2	1	1	3	24	5	7	39	17
Bull Hollow-Tenmile Canyon	81.0-83.0	3	2	1	1	3	24	5	7	39	17
Tenmile Canyon/Bottom	79.0-82.0	3	2	1	1	3	24	5	7	39	17
Keg Springs Canyon	75.0-78.5	3	2	1	1	3	24	5	7	39	17
Hey Joe Canyon	74.5-76.0	3	2	1	1	3	24	5	7	39	17
Hey Joe Canyon-Spring Canyon	74.0-75.0	3	2	1	1	3	24	5	7	39	17
Spring Canyon Point	69.5-74.0	3	2	1	1	3	24	5	7	39	17
Bowknot Bend	62.0-70.0	3	2	1	1	3	24	5	7	39	17
Twomile Canyon-Deadman Point	60.0-62.0	3	2	1	1	3	24	5	7	39	17
Deadman Point-Horseshoe Canyon	59.0-60.0	3	2	1	1	3	24	5	7	39	17
Downstream of Horseshoe Canyon	58.0-59.0	3	2	1	1	3	24	5	7	39	17
Cottonwood Bottom	55.0-56.5	3	2	1	1	3	24	5	7	39	17
Cottonwood-Mineral Bottoms	54.0-55.0	3	2	1	1	3	24	5	7	39	17
Mineral-Tidwell Bottoms	53.0-54.0	3	2	1	1	3	24	5	7	39	17
Tidwell Bottom	51.0-52.5	3	2	1	1	3	24	5	7	39	17
Horsethief Bottom	50.0-51.5	3	2	1	1	3	24	5	7	39	17
Woodruff Bottom	49.0-50.0	3	2	1	1	3	24	5	7	39	17
Point Bottom	47.5-49.5	3	2	1	1	3	24	5	7	39	17
Saddle Horse Bottom	45.5-47.5	3	2	1	1	3	24	5	7	39	17
Horsethief Canyon	45.0-46.0	3	2	1	1	3	24	5	7	39	17
Horsethief-Upheaval Bottom	44.0-45.5	3	2	1	1	3	24	5	7	39	17
Upheaval Bottom/Canyon	43.5-44.5	3	2	1	1	3	24	5	7	39	17
Hardscrabble Bottom	42.5-43.5	3	2	1	1	3	24	5	7	39	17
Hardscrabble-Fort Bottoms	38.5-42.5	3	2	1	1	3	24	5	7	39	17

Table F.1. Continued.

Site Description	River Mile	Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values multiplied by Average Weighted Point Values[b]				Total Score[c]	Rank[d]
		Status of land ownership	Proximity to spawn bar	June connection to river	Potential network of sites	Status of land ownership	Proximity to spawn bar	June connection to river	Potential network of sites		
Green River											
Potato Bottom	35.5-38.0	3	2	1	1	3	24	5	7	39	17
Potato-Beaver Bottoms	34.5-35.5	3	2	1	1	3	24	5	7	39	17
Beaver-Queen Ann Bottoms	33.5-34.5	3	2	1	1	3	24	5	7	39	17
Queen Ann Bottom	33.0-34.0	3	2	1	1	3	24	5	7	39	17
Queen Ann-Anderson Bottoms	32.0-33.0	3	2	1	1	3	24	5	7	39	17
Anderson Bottom	30.0-31.5	3	2	1	1	3	24	5	7	39	17
Unknown and Valentine Bottoms	29.0-32.0	3	2	1	1	3	24	5	7	39	17
Valentine Bottom	27.0-29.0	3	2	1	1	3	24	5	7	39	17
Stillwater Canyon-Sphinx	26.0-28.5	3	2	1	1	3	24	5	7	39	17
Downstream Valentine Bottom	25.5-26.5	3	2	1	1	3	24	5	7	39	17
Valentine-Tuxedo Bottoms	24.0-25.5	3	2	1	1	3	24	5	7	39	17
Tuxedo Bottom-Turks head	19.5-24.0	3	2	1	1	3	24	5	7	39	17
Deadhorse Canyon confluence	18.5-20.0	3	2	1	1	3	24	5	7	39	17
Downstream Deadhorse Canyon	17.0-19.0	3	2	1	1	3	24	5	7	39	17
Deadhorse-Horse Canyons	16.0-17.0	3	2	1	1	3	24	5	7	39	17
Horse Canyon	13.5-14.0	3	2	1	1	3	24	5	7	39	17
Downstream of Horse Canyon	12.5-13.5	3	2	1	1	3	24	5	7	39	17
Horse-Jasper Canyons	10.5-12.5	3	2	1	1	3	24	5	7	39	17
Jasper Canyon	8.0-10.5	3	2	1	1	3	24	5	7	39	17
Jasper Canyon-Short Canyon	5.0-8.0	3	2	1	1	3	24	5	7	39	17
Short Canyon-Colorado River	2.0-3.5	3	2	1	1	3	24	5	7	39	17
Upstream of Colorado River	1.0-2.0	3	2	1	1	3	24	5	7	39	17
Near Colorado River confluence	0.5-1.5	3	2	1	1	3	24	5	7	39	17
Colorado River confluence	0.0-0.5	3	2	1	1	3	24	5	7	39	17
Yampa River											
Upstream of Snake River confluence	48.0-48.5	1	1	3	1	1	12	15	7	35	19
White River											
Oxbow downstream Highway 64 bridge	91.0-93.0	1	2	3	1	1	24	15	7	47	15
White/Green river confluence	0.0-2.5	1	3	1	3	1	36	5	21	63	10

Table F.2. Selection criteria and associated sub-criteria raw score values multiplied by the average weighted point values to produce the total score and rank for each bottomland site in the Colorado and Gunnison rivers, Colorado and Utah, 1993. Top 13 ranked bottomland sites denoted by ✿.

		Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]					
Site Description	River Mile	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Total Score[c]	Rank[d]
Colorado River											
Rifle West	238.0-241.1	1	1	1	2	1	11	4	12	28	25
Rifle I-70 West Interchange	236.5-238.0	1	1	1	2	1	11	4	12	28	25
CDOW/Gentry Property	234.2-235.8	2	1	1	2	2	11	4	12	29	24
"Trash-can Pond"	230.2-230.8	1	1	3	2	1	11	12	12	36	19
Mahaffey/Lemon	228.2-229.8	1	1	3	2	1	11	12	12	36	19
Mahaffey's	228.5-229.5	1	1	3	2	1	11	12	12	36	19
Hoaglund's	227.1-227.7	1	1	3	2	1	11	12	12	36	19
Dere/Ortiz	227.5-228.5	1	1	3	2	1	11	12	12	36	19
Parachute East	223.1-225.4	1	1	3	2	1	11	12	12	36	19
Knight's	224.5-225.4	1	1	3	2	1	11	12	12	36	19
Parachute Bridge	223.0-223.4	1	1	3	2	1	11	12	12	36	19
"No-name"	227.7-223.1	1	1	1	2	1	11	4	12	28	25
"No-name"	221.1-222.9	1	1	1	2	1	11	4	12	28	25
✿Battlement Mesa	220.7-221.7	2	2	3	2	2	22	12	12	48	10
✿EXXON	218.9-220.1	1	2	3	2	1	22	12	12	47	11
Doyle Property	218.4-219.5	1	1	1	2	1	11	4	12	28	25
"No-name"	217.2-218.0	1	1	1	2	1	11	4	12	28	25
Una North	216.4-217.4	1	1	1	2	1	11	4	12	28	25
✿Wallace Creek Island	215.9-216.5	1	2	3	2	1	22	12	12	47	11
✿Stoddard Property	209.4-210.1	1	3	1	3	1	33	4	18	56	7
✿Debeque I-70 Slough	209.6-211.4	2	3	3	3	2	33	12	18	65	4
✿Latham's	207.9-208.8	1	2	3	3	2	33	12	18	53	9
✿"No-name"	206.2-207.5	1	2	3	3	1	22	12	18	53	9

[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see Methods section).

[b] Equal to the sub-criteria raw score value multiplied by the average weighted point value (e.g., for Walter Walker SWA this equals 1 X 2=2 for the status of land ownership criteria, 5 X 11=55 for the proximity to adult RZ captures criteria, 4 X 3=12 for the June connection to the river criteria, and 6 X 3=18 for the potential network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

Table F.2. Continued.

Site Description	River Mile	Sub-Criteria Raw Score Values[a]: Status of land ownership	Sub-Criteria Raw Score Values[a]: Proximity to adult RZ captures	Sub-Criteria Raw Score Values[a]: June connection to river	Sub-Criteria Raw Score Values[a]: Potential network of sites	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]: Status of land ownership	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]: Proximity to adult RZ captures	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]: June connection to river	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]: Potential network of sites	Total Score[c]	Rank[d]
Colorado River											
●Etter's	204.7-206.6	1	2	3	3	1	22	12	18	53	9
●"No-name"	202.3-204.2	1	2	3	2	1	22	12	12	47	11
●"No-name"	201.9-202.4	1	2	3	2	1	22	12	12	47	11
Long Point Bottom	198.0-198.9	3	1	3	1	1	11	12	6	30	23
Beavertail	194.3-195.6	3	1	1	1	3	11	4	6	24	26
Island Acres	191.1-192.1	2	1	1	1	2	11	4	6	23	27
Cameo	190.0-191.0	3	1	3	1	1	11	12	6	30	23
Palisade	184.2-185.0	2	2	1	2	1	22	4	12	39	16
●"No-name"	183.3-184.2	1	2	3	2	1	22	12	12	47	12
●Labor Camp	182.9-183.6	2	3	3	2	2	33	12	12	59	5
"No-name"	181.6-182.6	1	2	1	2	1	22	4	12	39	16
●"No-name"	181.7-182.2	1	2	3	2	1	22	12	12	47	11
"No-name"	180.4-181.5	1	2	1	2	1	22	4	12	39	16
●Clifton Water Treatment	179.1-181.1	1	2	1	3	1	22	4	18	45	13
●Clifton Pond	177.7-178.2	2	4	1	3	2	44	4	18	68	3
Corn Lake	176.6-177.7	2	1	1	2	2	11	4	12	29	24
●Humphrey's	175.3-176.6	2	2	3	3	1	22	12	18	53	9
●Griffith's	174.1-176.5	1	2	3	3	1	22	12	18	53	9
●"Hotspot Junction" (30-29 Road)	173.9-175.1	2	2	1	3	2	22	4	18	46	12
"No-name"	174.4-173.8	1	1	3	2	1	11	12	12	36	19
"No-name"	173.0-173.6	1	1	1	2	1	11	4	12	28	25
Mill Tailing Site	172.5-173.4	1	1	3	2	1	11	12	12	36	19
Watson Island	171.0-172.1	2	1	3	2	2	11	12	12	37	18
"No-Name"	171.3-171.8	1	2	3	1	1	22	12	6	41	15
"No-name"	170.4-171.0	1	2	3	1	1	22	12	6	41	15
Connected Lakes Area	168.7-170.3	2	2	1	1	2	22	4	6	34	20

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[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see Methods section).

[b] Equal to the sub-criteria raw score value multiplied by the average weighted point value (e.g., for Walter Walker SWA this equals 1 X 2=2 for the status of land ownership criteria, 5 X 11=55 for the proximity to adult RZ captures criteria, 4 X 3=12 for the June connection to the river criteria, and 6 X 3=18 for the potential network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

Table F.2. Continued.

Site Description	River Mile	Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]				Total Score[c]	Rank[d]
		Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites		
Colorado River											
*Walter Walker South	164.4-166.0	1	2	3	2	2	22	12	12	48	10
*"No-name"	166.4-169.6	1	2	3	2	2	22	12	12	48	10
Appleton Drain East	165.1-166.4	1	2	1	2	1	22	4	12	39	16
*Walter Walker SWA	162.7-165.1	2	5	3	3	2	55	12	18	87	1
*Panorama	163.1-163.6	1	3	3	2	1	33	12	12	58	6
*"No-name"	161.0-162.7	1	2	3	2	1	22	12	12	47	11
DuPont Island	161.0-162.0	1	1	3	2	1	11	12	12	36	19
DuPont's	159.1-161.9	1	1	3	2	1	11	14	12	38	17
Paul Smith's	158.0-159.1	1	1	3	2	1	11	12	12	36	19
Fruita 340 Bridge	157.5-158.3	1	1	3	2	1	11	12	12	36	19
Snook's Bottom	155.9-157.1	3	1	3	2	3	11	12	12	38	17
Horsethief SWA	151.9-154.7	2	1	3	2	2	11	12	12	37	18
Spann's	151.4-152.4	1	1	1	1	1	11	4	6	22	28
"No-name"	137.2-137.1	3	1	1	1	3	11	4	6	24	26
Crow Bottom	143.9-146.5	3	1	1	1	3	11	4	6	24	26
"No-name"	145.5-146.6	1	1	1	1	1	11	4	6	21	29
Vulture Bottom	139.7-142.1	3	1	1	1	3	11	4	6	24	26
"No-name" Island	137.2-138.0	3	1	1	1	3	11	4	6	24	26
Black Rocks	136.7-137.1	3	1	3	1	3	11	12	6	32	21
Knowles Canyon	133.6-135.0	3	1	3	6	3	11	12	6	24	26
Jouflas Bottom	129.8-133.9	3	1	1	1	3	11	4	6	24	26
Wildass Canyon Ranch	127.3-131.3	1	1	3	1	3	11	12	6	30	23
"No-name"	125.8-126.8	3	1	3	1	3	11	12	6	32	21
Elizondo Ranches	126.5-127.8	1	1	1	1	1	11	4	6	22	28
Westwater Wash	124.8-126.0	1	1	3	1	1	11	12	6	30	23
Cisco Landing Area	107.6-111.6	3	1	3	2	3	11	12	12	38	17

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[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see Methods section).

[b] Equal to the sub-criteria raw score value multiplied by the average weighted point value (e.g., for Walter Walker SWA this equals 1 X 2=2 for the status of land ownership criteria, 5 X 11=55 for the proximity to adult RZ captures criteria, 4 X 3=12 for the June connection to the river criteria, and 6 X 3=18 for the potential network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

Table F.2. Continued.

Site Description	River Mile	Sub-Criteria Raw Score Values[a] Status of land ownership	Sub-Criteria Raw Score Values[a] Proximity to adult RZ captures	Sub-Criteria Raw Score Values[a] June connection to river	Sub-Criteria Raw Score Values[a] Potential network of sites	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b] Status of land ownership	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b] Proximty to adult RZ captures	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b] June connection to river	Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b] Potential network of sites	Total Score[c]	Rank[d]
Colorado River											
Fish Ford Area	103.0-105.9	3	1	3	2	3	11	12	12	38	17
McGraw/Hotel Bottom	98.1-101.0	2	1	3	2	2	11	12	12	31	22
White Ranch	77.5-78.4	1	1	1	1	1	11	4	6	22	28
Courthouse Wash	63.8	1	1	3	1	1	11	12	6	30	23
Moab Slough	61.5-64.0	2	1	3	1	2	11	12	6	31	22
Kane Spring	58.2	3	1	3	1	3	11	12	6	32	21
Billboard (Lake Bottom)	59.9-52.5	3	1	1	1	3	11	4	6	24	26
Jackson Bottom	47.4-49.0	1	1	3	1	1	11	12	6	30	23
"No-name"	44.0-44.7	3	1	1	1	3	11	4	6	24	26
"No-name"	42.8-43.7	3	1	3	1	3	11	12	6	32	21
"No-name"	41.1-42.1	3	1	3	1	3	11	12	6	32	21
"No-name"	40.2-41.3	3	1	3	1	3	11	12	6	32	21
"No-name"	39.5-40.6	3	1	3	1	3	11	12	6	32	21
"No-name" Canyon Mouth	38.8	3	1	3	1	3	11	12	6	32	21
"No-name"	38.6-39.2	3	1	1	1	3	11	4	6	32	21
Goose Neck	33.2-35.6	3	1	3	1	3	11	12	6	32	21
Shafer Canyon Mouth	34.8	3	1	3	1	3	11	12	6	32	21
"No-name" Canyon Mouth	32.1	3	1	3	1	3	11	12	6	32	21
"No-name" Canyon Mouth	31.6	3	1	3	1	3	11	12	6	32	21
"No-name"	30.8-31.9	3	1	1	1	3	11	4	6	32	21
Little Bridge Canyon	30.0	3	1	3	1	3	11	12	6	32	21
Lockhart Canyon	26.5	3	1	3	1	3	11	12	6	32	21
"No-name"	25.3-26.5	3	1	1	1	3	11	4	6	24	26
Lathrop Canyon	23.5	3	1	3	1	3	11	12	6	32	21
Buck Canyon	22.7	3	1	3	1	3	11	12	6	32	21
Gooseberry Canyon	21.7	3	1	3	1	3	11	12	6	32	21

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[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see Methods section).

[b] Equal to the sub-criteria raw score value multiplied by the average weighted point value (e.g., for Walter Walker SWA this equals 1 X 2=2 for the status of land ownership criteria, 5 X 11=55 for the proximity to adult RZ captures criteria, 4 X 3=12 for the June connection to the river criteria, and 6 X 3=18 for the potential network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

Table F.2. Continued.

		Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]					
Site Description	River Mile	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Total Score[c]	Rank[d]
Colorado River											
Dogleg Canyon	21.2	3	1	3	1	3	11	12	6	32	21
Sheep Bottom	17.5-18.7	3	1	1	1	3	11	4	6	24	26
Indian Creek Canyon Mouth	16.5	3	1	3	1	3	11	12	6	32	21
Monument Creek Mouth	15.3	3	1	1	1	3	11	4	6	24	26
"No-name" Canyon Mouth	11.9	3	1	1	1	3	11	4	6	24	26
"No-name" Canyon Mouth	10.1	3	1	3	1	3	11	12	6	32	21
Salt Creek Canyon Mouth	3.4	3	1	3	1	3	11	12	6	32	21
Elephant Creek Canyon Mouth	3.0	3	1	3	1	3	11	12	6	32	21
Gunnison River											
"No-name"	74.3-74.7	1	1	1	1	1	11	4	6	22	28
Lawhead Gulch Bottom	70.1-71.6	1	1	3	1	1	1	12	6	30	23
Ferganchick's	69.5-70.5	1	1	3	1	1	11	12	6	30	23
"No-name"	68.3-69.4	1	1	2	1	1	11	12	6	30	23
"No-name"	67.5-68.2	1	1	1	1	1	11	4	6	22	28
Austin County Bridge	65.7-66.4	1	1	1	1	1	11	4	6	22	28
Austin Hwy 92 Bridge	65.0-65.5	1	1	3	1	1	11	12	6	30	23
"No-name"	63.3-65.3	1	1	3	1	1	11	12	6	30	23
"No-name"	63.0-64.6	1	1	1	1	1	11	4	6	22	28
Colorado Hwy 65 Bridge	62.6-63.2	1	1	3	2	1	11	12	12	36	19
Tongue Creek	61.5-62.5	1	1	3	2	1	11	12	12	36	19
Hutchin's	60.1-60.8	1	1	3	2	1	11	12	12	36	19

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[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see Methods section).

[b] Equal to the sub-criteria raw score value multiplied by the average weighted point value (e.g., for Walter Walker SWA this equals 1 X 2=2 for the status of land ownership criteria, 5 X 11=55 for the proximity to adult RZ captures criteria, 4 X 3=12 for the June connection to the river criteria, and 6 X 3=18 for the potential network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

Table F.2. Continued.

		Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]					
Site Description	River Mile	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Total Score[c]	Rank[d]
Gunnison River											
North Delta	57.6-59.5	1	1	3	2	1	11	12	12	36	19
South Delta	57.6-58.8	1	1	1	2	1	11	4	12	28	25
Confluence Park	56.7-57.7	2	1	3	3	1	11	12	18	43	14
Uncompahgre R. Confluence	56.3-56.5	2	1	3	2	1	11	12	12	36	19
Delta City Sewage Plant	55.6-56.5	2	1	3	2	2	11	12	12	37	18
"No-name"	54.6-55.5	1	1	3	2	1	11	12	12	36	19
"No-name"	54.2-55.1	1	1	3	2	1	11	12	12	36	19
"No-name"	53.1-54.1	1	1	1	2	1	11	4	12	28	25
*Johnson Boy's Slough	53.2-54.2	1	4	3	3	1	44	12	18	75	2
*Escalante SWA North	50.8-52.9	2	2	3	3	2	22	12	10	54	8
*Escalante SWA South	50.2-52.4	2	2	3	3	2	22	12	18	54	8
"Blue Duck" Bottom	49.5-50.4	2	1	3	1	2	11	12	6	21	22
"No-name"	49.4-49.7	2	1	3	1	1	11	12	6	30	23
"No-name"	48.6-49.3	1	1	3	1	1	11	12	6	30	23
"No-name"	46.6-47.5	1	1	3	1	1	11	12	6	30	23
Escalante Ranches	41.7-42.8	1	1	3	1	1	11	12	6	30	23
"No-name"	39.9-41.0	3	1	3	1	3	11	12	6	32	21
Dominguez	36.4-36.9	1	1	3	1	1	11	12	6	30	23
Broughton	35.6-36.0	1	1	3	1	1	11	12	6	30	23
McKendrick's	34.8-36.3	1	1	3	1	1	11	12	6	30	23
Peeple's South (VIP Camp)	34.0-35.2	1	1	3	1	1	11	12	6	30	23
Peeple's Island	34.6-34.9	1	1	3	1	1	11	12	6	30	23
Sand Flat	27.3-28.7	1	1	1	1	1	11	4	6	30	23

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[a] Each selection criteria is further sub-divided into sub-criteria and given a raw score value (see Methods section).

[b] Equal to the sub-criteria raw score value multiplied by the average weighted point value (e.g., for Walter Walker SWA this equals 1 X 2=2 for the status of land ownership criteria, 5 X 11=55 for the proximity to adult RZ captures criteria, 4 X 3=12 for the June connection to the river criteria, and 6 X 3=18 for the potential network of sites criteria).

[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

Table F.2. Continued.

Site Description	River Mile	Sub-Criteria Raw Score Values[a]				Sub-Criteria Raw Score Values Multiplied by Average Weighted Point Values[b]					
		Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Status of land ownership	Proximity to adult RZ captures	June connection to river	Potential network of sites	Total Score[c]	Rank[d]
Gunnison River											
Tunnel Point	26.3-26.9	3	1	3	1	3	11	12	6	32	21
Dads Flat	24.7-26.3	1	1	3	1	1	11	12	6	30	23
Deer Run	23.0-23.6	3	1	3	1	3	11	12	6	32	21
"No-name"	22.1-22.7	3	11	3	1	3	11	12	6	32	21
"No-name"	21.3-21.8	3	1	3	1	3	11	12	6	24	26
"No-name"	18.4-19.2	3	1	3	1	3	11	12	6	32	21
Kannah Creek	16.0-18.6	1	1	3	1	1	11	12	6	30	23
Whitewater Blding Materials	13.3-16.0	1	1	3	1	1	11	12	6	30	23
Duck Blind	12.7-13.8	1	1	3	1	1	11	12	6	30	23
Bangs Canyon	11.7-13.0	1	1	1	1	1	11	4	6	24	26
Schroeder's	4.5-6.1	1	1	3	1	1	11	12	6	30	23
Mule Farm	3.1-3.9	1	1	1	1	1	11	4	6	24	26
Redlands	2.2-3.0	1	1	1	1	1	11	4	6	24	26

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[c] Equal to the sum of the sub-criteria raw score values multiplied by the average weighted point values (e.g., for Walter Walker SWA this equals 2+55+12+18=87).

[d] The total score was sorted from the lowest to highest ordinal with the highest total score receiving the lowest ordinal rank and lowest total score the highest ordinal rank. The lowest ordinal rank was the top priority site and the highest ordinal rank the bottom priority site.

APPENDIX G

Land ownership acreage for the Colorado and Gunnison rivers

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Table G.1. Land ownership status by area (hectares) and percentage for 158 bottomland sites adjacent to the Colorado and Gunnison rivers (see Figures 25 and 26).

River Stream Reach (River Mile)	Land Ownership Status												
			Public										
	Private	%	State	%	City	%	Federal[a]	%	State/ Federal	%	Public/ Private[b]	%	Total
Colorado													
Rifle-Debeque (240-203)	951	93	67	7	0	0	0	0	0	0	0	0	1,018
Palisade-Loma (185-152)	1,194	64	0	0	63	3	0	0	181	10	426	23	1,864
Loma-Stateline (152-132)	40	14	0	0	0	0	93	32	0	0	158	54	291
Stateline-Moab (132-63)	387	25	0	0	0	0	100	7	0	0	1,034	68	1,521
Moab-Green River Confluence (63-0.0)	0	0	22	7	0	0	265	83	11	3	23	7	321
TOTALS	2,572	51	89	2	63	1	458	9	192	4	1,641	33	5,015
Gunnison													
North Fork-Austin (75-67)	88	100	0	0	0	0	0	0	0	0	0	0	88
Austin-Railroad Bridge (67-50)	419	64	193	30	40	6	0	0	0	0	0	0	652
Railroad Bridge-Colorado R. Confluence (50-0.7)	392	72	11	2	0	0	42	8	36	7	66	12	547
TOTALS	899	70	204	16	40	3	42	3	36	3	66	5	1,287

[a] Includes lands owned or controlled by Bureau of Land Management, Bureau of Reclamation or the National Park Service.

[b] Includes both Federal and State lands interspersed with private ownership.

APPENDIX H

Nine initial criteria and sub-criteria considered for scoring and ranking bottomland sites

Table H.1. The initial nine criteria and sub-criteria considered for selection criteria for scoring and ranking bottomland sites in the Upper Colorado River Basin.

1. Area
   - ≥ 75 acres (Total Potential [historical] Inundated Area)
   - < 75 acres (" " " " ")
2. Ownership
   - Public
   - Private
3. Proximity to Fish Use (Historical and Current)
   - 1- 25 River miles
   - 26- 50 " "
   - 51-100 " "
   - >100 " "
4. Water Permanency/Duration (June-September)
   - Yes/No
5. Present Hydrological Connection to River
   - Yes/No
6. Wetland Feature
   - Natural
   - Man-made
7. Suitability or Appropriate for Fish/Water Control Structures
   - Yes/No
8. Diked/Riprap; Other Obstruction
   - Yes/No
9. Potential for Network of Sites (within 25 river miles of known historical or current fish use: RZ, CS)

   Number of Sites within 25 miles to comprise a network of sites
   - 0-1 Sites
   - 2-3 "
   - ≥4 "

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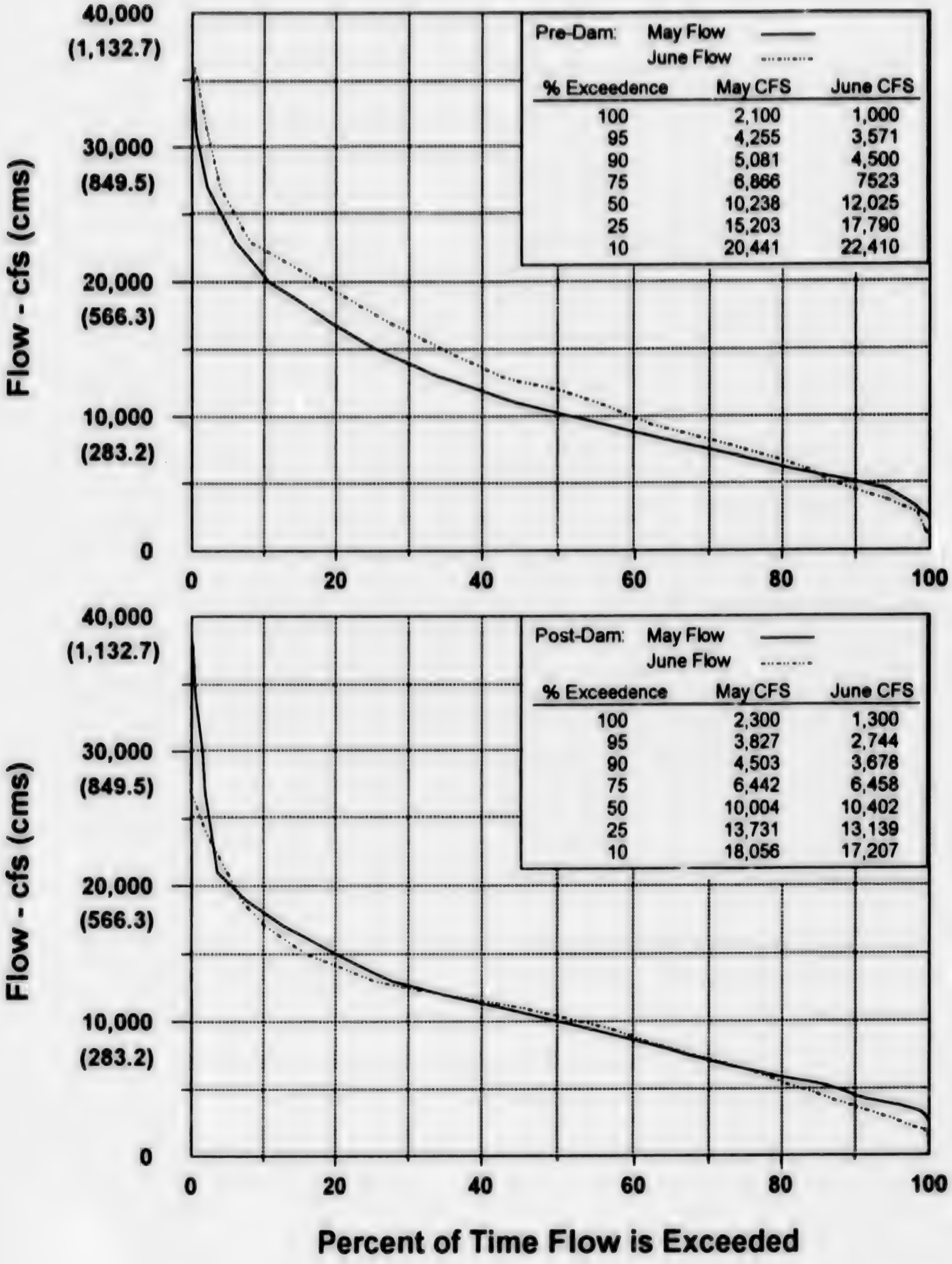
APPENDIX I
Mean daily flow exceedences



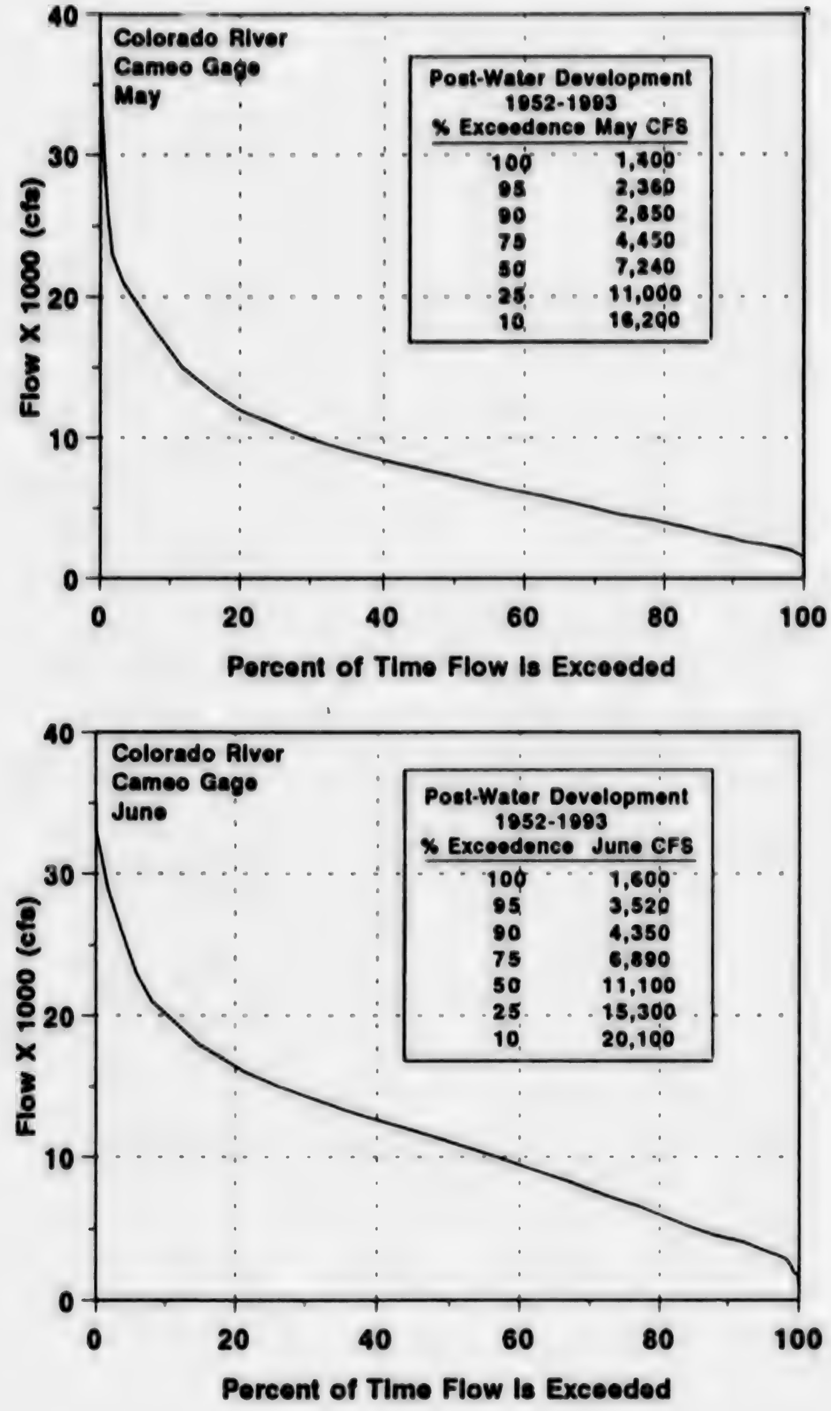
Pre-Dam:

% Exceedence	May CFS	June CFS
100	2,100	1,000
95	4,255	3,571
90	5,081	4,500
75	6,866	7523
50	10,238	12,025
25	15,203	17,790
10	20,441	22,410

Post-Dam:

% Exceedence	May CFS	June CFS
100	2,300	1,300
95	3,827	2,744
90	4,503	3,678
75	6,442	6,458
50	10,004	10,402
25	13,731	13,139
10	18,056	17,207

Figure I.1. Percent of time flow (cfs [cms]) is exceeded in the Green River before (1947-1966) and after (1966-1993) Flaming Gorge Dam.



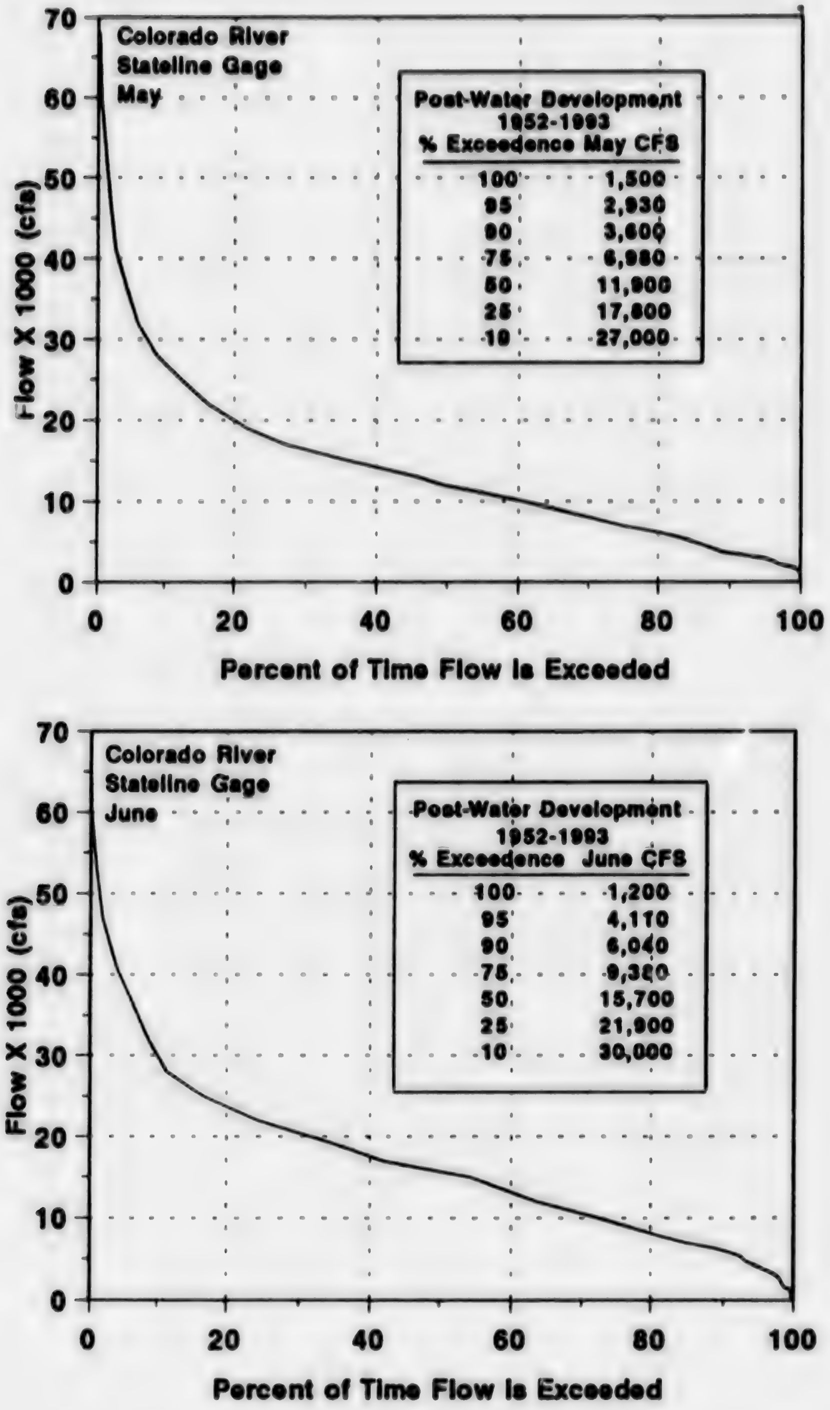
Post-Water Development
1952-1993

% Exceedence	May CFS
100	1,400
95	2,360
90	2,850
75	4,450
50	7,240
25	11,000
10	16,200

Post-Water Development
1952-1993

% Exceedence	June CFS
100	1,600
95	3,520
90	4,350
75	6,890
50	11,100
25	15,300
10	20,100

Figure I.2. Mean daily flow exceedences for May (top) and June (bottom) for the Colorado River at the Cameo USGS stream gauge during the post-water development period, 1952-1993.



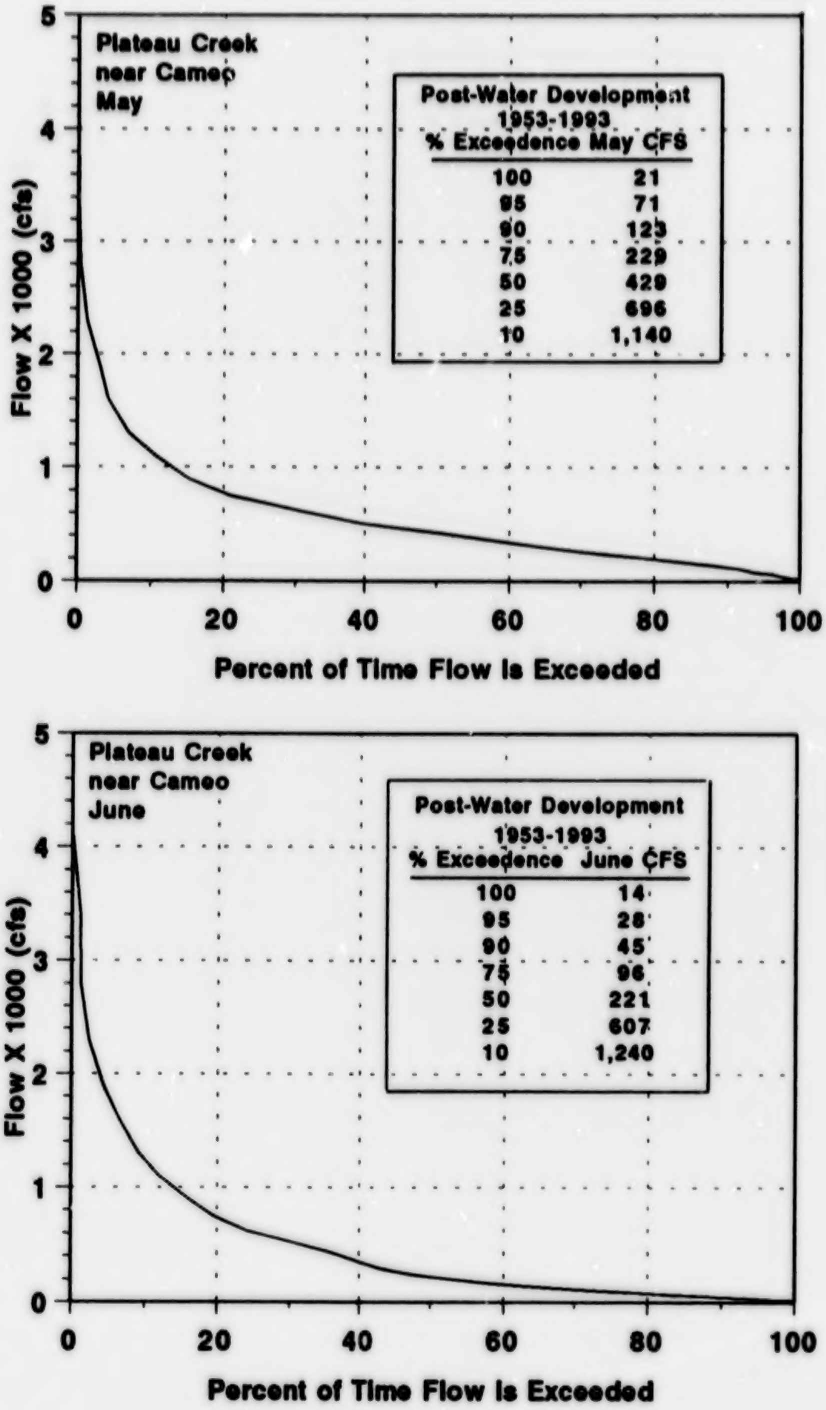
Post-Water Development
1952-1993

% Exceedence	May CFS
100	1,500
95	2,930
90	3,600
75	6,980
50	11,900
25	17,800
10	27,000

Post-Water Development
1952-1993

% Exceedence	June CFS
100	1,200
95	4,110
90	6,040
75	9,360
50	15,700
25	21,900
10	30,000

Figure I.3. Mean daily flow exceedences for May (top) and June (bottom) for the Colorado River at the Stateline USGS stream gauge during the post-water development period, 1952-1993.



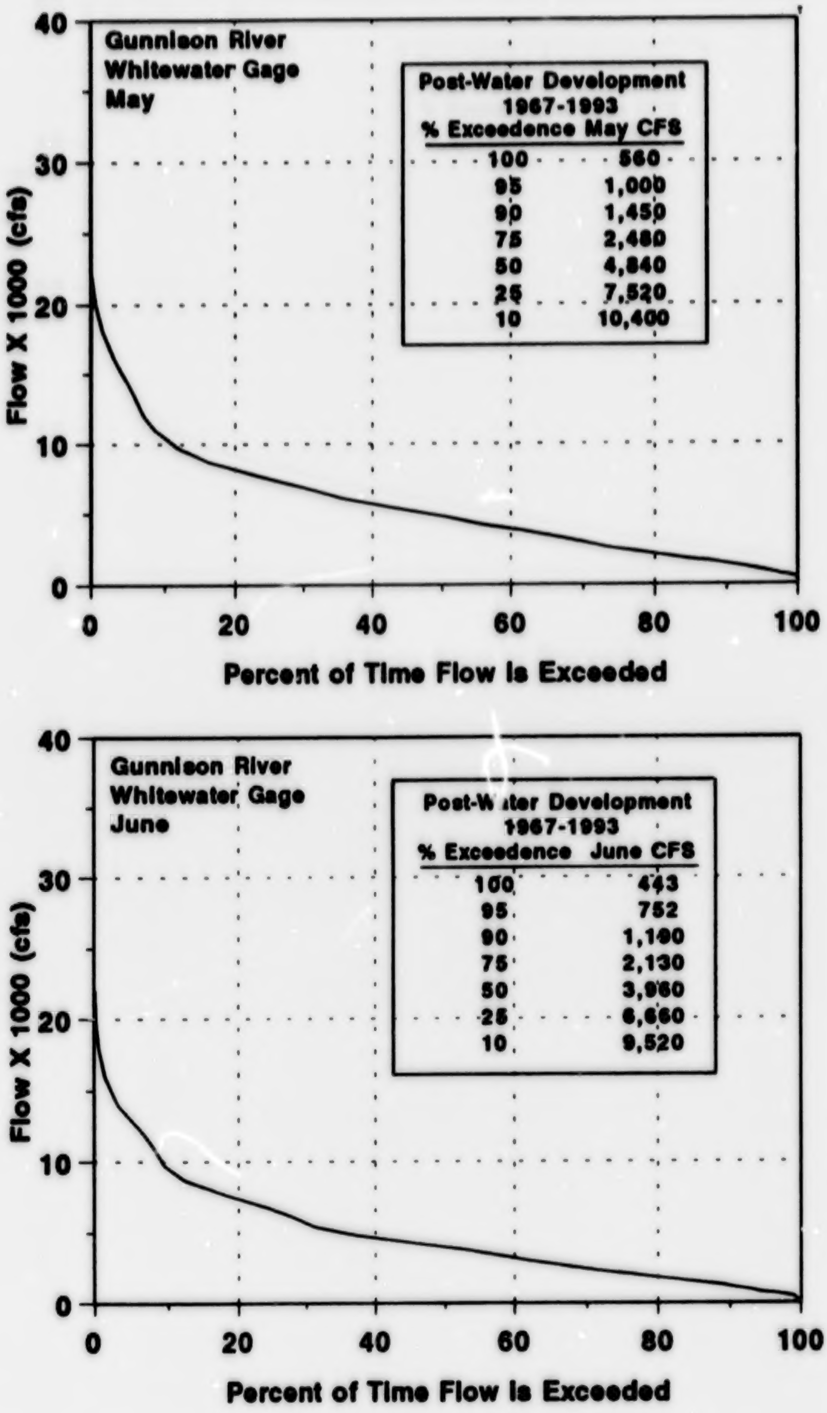
Post-Water Development
1953-1993

% Exceedence	May CFS
100	21
95	71
90	123
75	229
50	429
25	696
10	1,140

Post-Water Development
1953-1993

% Exceedence	June CFS
100	14
95	28
90	45
75	96
50	221
25	607
10	1,240

Figure I.4. Mean daily flow exceedences for May (top) and June (bottom) for Plateau Creek (near the confluence with the Colorado River) USGS stream gauge during the post-water development period, 1953-1993.



Post-Water Development
1967-1993

% Exceedence	May CFS
100	560
95	1,000
90	1,450
75	2,480
50	4,840
25	7,520
10	10,400

Post-Water Development
1967-1993

% Exceedence	June CFS
100	443
95	752
90	1,190
75	2,130
50	3,960
25	6,660
10	9,520

Figure I.5. Mean daily flow exceedences for May (top) and June (bottom) for the Gunnison River at the Whitewater USGS stream gauge during the post-water development period, 1967-1993.

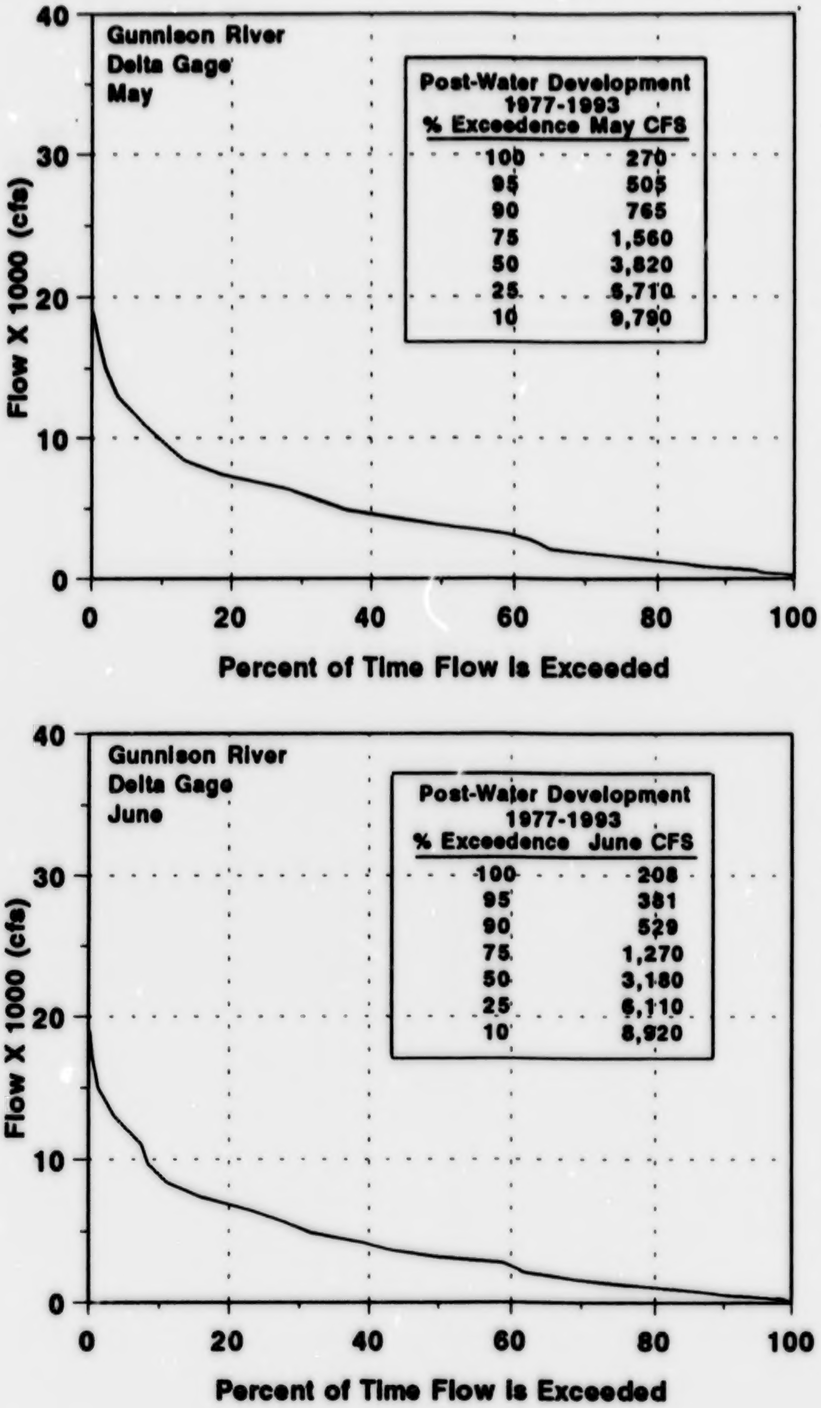


Figure I.6. Mean daily flow exceedences for May (top) and June (bottom) for the Gunnison River at the Delta USGS stream gauge during the post-water development period, 1977-1993.

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END

07-27-98